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An Assessment of Research-Doctorate Programs in the United States: *Mathematical & Physical Sciences*

Committee on an Assessment of Quality-Related Characteristics
of Research-Doctorate Programs in the United States

Lyle V. Jones, Gardner Lindzey, and
Porter E. Coggeshall, *Editors*

Sponsored by

The Conference Board of Associated Research Councils

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Blue page insert duplicates page 15 and may be used as a portable guide to program measures by placing it beside the tables under examination.

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To Porter E. Coggeshall, Study Director, the committee expresses thanks for a job extremely well done. His ability to translate the committee's directions into compiled data and analyses must be given a large share of the credit for the completion of this project. He has been ably assisted by Prudence W. Brown, who supervised the data collection activities; Dorothy G. Cooper, who provided excellent secretarial support; and George A. Boyce, whose programming expertise was invaluable.

Committee on an Assessment of Quality-Related
Characteristics of Research-Doctorate Programs
in the United States

Preface

The genius of American higher education is often said to be in the close association of training and research--that is, in the nation's research-doctorate programs. Consequently, we are not surprised at the amount of worried talk about the quality of the research doctorate, for deterioration at that level will inevitably spread to wherever research skills are needed--and that indeed is a far-flung network of laboratories, institutes, firms, agencies, bureaus, and departments. What might surprise us, however, is the imbalance between the putative national importance of research-doctorate programs and the amount of sustained evaluative attention they themselves receive.

The present assessment, sponsored by the Conference Board of Associated Research Councils--comprised of the American Council of Learned Societies, the American Council on Education, the National Research Council (NRC), and the Social Science Research Council--seeks to correct the imbalance between worried talk and systematic study. In this effort the Conference Board continues a tradition pioneered by the American Council on Education, which in 1966 published An Assessment of Quality in Graduate Education, the report of a study conducted by Allan M. Cartter, and in 1970 published A Rating of Graduate Programs, by Kenneth D. Roose and Charles J. Andersen. The Cartter and Roose-Andersen reports have been widely used and frequently cited.

Some years after the release of the Roose-Andersen report, it was decided that the effort to assess the quality of research-doctorate programs should be renewed, and the Conference Board of Associated Research Councils agreed to sponsor an assessment. The Board of Directors of the American Council on Education concurred with the notion that the next study should be issued under these broader auspices. The NRC agreed to serve as secretariat for a new study. The responsible staff of the NRC earned the appreciation of the Conference Board for the skill and dedication shown during the course of securing funding and implementing the study. Special mention should also be made of the financial contribution of the National Academy of Sciences which, by supplementing funds available from external sources, made it possible for the study to get under way.

To sponsor a study comparing the quality of programs in 32

disciplines and from more than 200 doctorate-granting universities is to invite critics, friendly and otherwise. Such was the fate of the previous studies; such has been the fate of the present study. Scholarship, fortunately, can put criticism to creative use and has done so in this project. The study committee appointed by the Conference Board reviewed the criticisms of earlier efforts to assess research-doctorate programs, and it actively solicited criticisms and suggestions for improvements of its own design. Although constrained by limited funds, the committee applied state-of-the-art methodology in a design that incorporated the lessons learned from previous studies as well as attending to many critics of the present effort. Not all criticism has thus been stilled; nor could it ever be. Additional criticisms will be voiced by as many persons as begin to use the results of this effort in ways not anticipated by its authors. These criticisms will be welcome. The Conference Board believes that the present study, building on earlier criticisms and adopting a multidimensional approach to the assessment of research-doctorate programs, represents a substantial improvement over past reports. Nevertheless, each of the diverse measures used here has its own limitations, and none provides a precise index of the quality of a program for educating students for careers in research. No doubt a future study, taking into account the weaknesses as well as strengths of this effort, will represent still further improvement. One mark of success for the present study would be for it to take its place in a continuing series, thereby contributing to the indicator base necessary for informed policies that will maintain and perhaps enhance the quality of the nation's research-doctorate programs.

For the more immediate future the purposes of this assessment are to assist students and student advisers seeking the best match possible between individual career goals and the choice of an advanced degree program; to serve scholars whose study site is higher education and the nation's research enterprise; and to inform the practical judgment of the administrators, funders, and policymakers responsible for protecting the quality of scholarly education in the United States.

A remarkably hard-working and competent group, whose names appear on p. vii, oversaw the long process by which this study moved from the planning stage to the completion of these reports. The Conference Board expresses its warmest thanks to the members of its committee and especially to their co-chairmen, Lyle V. Jones and Gardner Lindzey.

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I

Origins of Study and Selection of Programs

Each year more than 22,000 candidates are awarded doctorates in engineering, the humanities, and the sciences from approximately 250 U.S. universities. They have spent, on the average, five-and-a-half years in intensive education in preparation for research careers either in universities or in settings outside the academic sector, and many will make significant contributions to research. Yet we are poorly informed concerning the quality of the programs producing these graduates. This study is intended to provide information pertinent to this complex and controversial subject.

The charge to the study committee directed it to build upon the planning that preceded it. The planning stages included a detailed review of the methodologies and the results of past studies that had focused on the assessment of doctoral-level programs. The committee has taken into consideration the reactions of various groups and individuals to those studies. The present assessment draws upon previous experience with program evaluation, with the aim of improving what was useful and avoiding some of the difficulties encountered in past studies. The present study, nevertheless, is not purely reactive: it has its own distinctive features. First, it focuses only on programs awarding research doctorates and their effectiveness in preparing students for careers in research. Although other purposes of graduate education are acknowledged to be important, they are outside the scope of this assessment. Second, the study examines a variety of different indices that may be relevant to the program quality. This multidimensional approach represents an explicit recognition of the limitations of studies that rely entirely on peer ratings of perceived quality--the so-called reputational ratings. Finally, in the compilation of reputational ratings in this study, evaluators were provided the names of faculty members involved with each program to be rated and the number of research doctorates awarded in the last five years. In previous reputational studies evaluators were not supplied such information.

During the past two decades increasing attention has been given to describing and measuring the quality of programs in graduate education. It is evident that the assessment of graduate programs is highly important for university administrators and faculty, for employers in industrial and government laboratories, for graduate students and prospective graduate students, for policymakers in state and national organizations, and for private and public funding agencies. Past experience, however, has demonstrated the difficulties with such assessments and their potentially controversial nature. As one critic has asserted:

> . . . the overall effect of these reports seems quite clear. They tend, first, to make the rich richer and the poor poorer; second, the example of the highly ranked clearly imposes constraints on those institutions lower down the scale (the "Hertz-Avis" effect). And the effect of such constraints is to reduce diversity, to reward conformity or respectability, to penalize genuine experiment or risk. There is, also, I believe, an obvious tendency to promote the prevalence of disciplinary dogma and orthodoxy. All of this might be tolerable if the reports were tolerably accurate and judicious, if they were less prescriptive and more descriptive; if they did not pretend to "objectivity" and if the very fact of ranking were not pernicious and invidious; if they genuinely promoted a meaningful "meritocracy"(instead of simply perpetuating the status quo ante and an establishment mentality). But this is precisely what they cannot claim to be or do.[1]

The widespread criticisms of ratings in graduate education were carefully considered in the planning of this study. At the outset consideration was given to whether a national assessment of graduate programs should be undertaken at this time and, if so, what methods should be employed. The next two sections in this chapter examine the background and rationale for the decision by the Conference Board of Associated Research Councils[2] to embark on such a study. The remainder of the chapter describes the selection of disciplines and programs to be covered in the assessment.

The overall study encompasses a total of 2,699 graduate programs in 32 disciplines. In this report--the first of five reports issuing from the study--we examine 596 programs in six disciplines in the mathematical and physical sciences: chemistry, computer sciences, geosciences, mathematics, physics, and statistics/biostatistics. These programs account for more than 90 percent of the research doctorates awarded in these six disciplines. It should be emphasized that the selection of disciplines to be covered was determined on the basis of total doctoral awards during the FY1976-78 period (as described later in this chapter), and the exclusion of a particular discipline was in no way based on a judgment of the importance of graduate education or research in that discipline. Also, although the assessment is limited to programs leading to the research-doctorate (Ph.D. or equivalent) degree, the Conference Board and study committee recognize that graduate schools provide many other forms of valuable and needed education.

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[1] William A. Arrowsmith, "Preface" in The Ranking Game: The Power of the Academic Elite, by W. Patrick Dolan, University of Nebraska Printing and Duplicating Service, Lincoln, Nebraska, 1976, p. ix.

[2] The Conference Board includes representatives of the American Council of Learned Societies, American Council on Education, National Research Council, and Social Science Research Council.

PRIOR ATTEMPTS TO ASSESS QUALITY IN GRADUATE EDUCATION

Universities and affiliated organizations have taken the lead in the review of programs in graduate education. At most institutions program reviews are carried out on a regular basis and include a comprehensive examination of the curriculum and educational resources as well as the qualifications of faculty and students. One special form of evaluation is that associated with institutional accreditation:

> The process begins with the institutional or programmatic self-study, a comprehensive effort to measure progress according to previously accepted objectives. The self-study considers the interest of a broad cross-section of constituencies--students, faculty, administrators, alumni, trustees, and in some circumstances the local community. The resulting report is reviewed by the appropriate accrediting commission and serves as the basis for evaluation by a site-visit team from the accrediting group. . . . Public as well as educational needs must be served simultaneously in determining and fostering standards of quality and integrity in the institutions and such specialized programs as they offer. Accreditation, conducted through non-governmental institutional and specialized agencies, provides a major means for meeting those needs.[3]

Although formal accreditation procedures play an important role in higher education, many university administrators do not view such procedures as an adequate means of assessing program quality. Other efforts are being made by universities to evaluate their programs in graduate education. The Educational Testing Service, with the sponsorship of the Council of Graduate Schools in the United States and the Graduate Record Examinations Board, has recently developed a set of procedures to assist institutions in evaluating their own graduate programs.[4]

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[3] Council on Postsecondary Accreditation, The Balance Wheel for Accreditation, Washington, D.C., July 1981, pp. 2-3.

While reviews at the institutional (or state) level have proven useful in assessing the relative strengths and weaknesses of individual programs, they have not provided the information required for making national comparisons of graduate programs. Several attempts have been made at such comparisons. The most widely used of these have been the studies by Keniston (1959), Cartter (1966), and Roose and Andersen (1970). All three studies covered a broad range of disciplines in engineering, the humanities, and the sciences and were based on the opinions of knowledgeable individuals in the program areas covered. Keniston[5] surveyed the department chairmen at 25 leading institutions. The Cartter[6] and Roose-Andersen[7] studies compiled ratings from much larger groups of faculty peers. The stated motivation for these studies was to increase knowledge concerning the quality of graduate education:

> A number of reasons can be advanced for undertaking such a study. The diversity of the American system of higher education has properly been regarded by both the professional educator and the layman as a great source of strength, since it permits flexibility and adaptability and encourages experimentation and competing solutions to common problems. Yet diversity also poses problems. . . . Diversity can be a costly luxury if it is accompanied by ignorance. . . . Just as consumer knowledge and honest advertising are requisite if a competitive economy is to work satisfactorily, so an improved knowledge of opportunities and of quality is desirable if a diverse educational system is to work effectively.[8]

Although the program ratings from the Cartter and Roose-Andersen studies are highly correlated, some substantial differences in successive ratings can be detected for a small number of programs--suggesting changes in the programs or in the perception of the programs. For the past decade the Roose-Andersen ratings have generally been regarded as the best available source of information on the quality of doctoral programs. Although the ratings are now more than 10 years out of date and have been criticized on a variety of grounds, they are still used extensively by individuals within the academic community and by those in federal and state agencies.

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[4] For a description of these procedures see M. J. Clark, Graduate Program Self-Assessment Service: Handbook for Users, Educational Testing Service, Princeton, New Jersey, 1980.

[5] H. Keniston, Graduate Study in Research in the Arts and Sciences at the University of Pennsylvania, University of Pennsylvania Press, Phildelphia, 1959.

[6] A. M. Cartter, An Assessment of Quality in Graduate Education, American Council on Education, Washington, D.C., 1966.

[7] K. D. Roose and C. J. Andersen, A Rating of Graduate Programs, American Council on Education, Washington, D.C., 1970.

[8] Cartter, p. 3.

A frequently cited criticism of the Cartter and Roose-Andersen studies is their exclusive reliance upon reputational measurement.

> The ACE rankings are but a small part of all the evaluative processes, but they are also the most public, and they are clearly based on the narrow assumptions and elitist structures that so dominate the present direction of higher education in the United States. As long as our most prestigious source of information about post-secondary education is a vague popularity contest, the resultant ignorance will continue to provide a cover for the repetitious aping of a single model. . . . All the attempts to change higher education will ultimately be strangled by the "legitimate" evaluative processes that have already programmed a single set of responses from the start.[9]

A number of other criticisms have been leveled at reputational rankings of graduate programs.[10] First, such studies inherently reflect perceptions that may be several years out of date and do not take into account recent changes in a program. Second, the ratings of individual programs are likely to be influenced by the overall reputation of the university--i.e., an institutional "halo effect." Also, a disproportionately large fraction of the evaluators are graduates of and/or faculty members in the largest programs, which may bias the survey results. Finally, on the basis of such studies it may not be possible to differentiate among many of the lesser known programs in which relatively few faculty members have established national reputations in research.

Despite such criticisms several studies based on methodologies similar to that employed by Cartter and Roose and Andersen have been carried out during the past 10 years. Some of these studies evaluated post-baccalaureate programs in areas not covered in the two earlier reports--including business, religion, educational administration, and medicine. Others have focused exclusively on programs in particular disciplines within the sciences and humanities. A few attempts have been made to assess graduate programs in a broad range of disciplines, many of which were covered in the Roose-Andersen and Cartter ratings, but in the opinion of many each has serious deficiencies in the methods and procedures employed. In addition to such studies, a myriad of articles have been written on the assessment of graduate programs since the release of the Roose-Andersen report. With the heightening interest in these evaluations, many in the academic community have recognized the need to assess graduate programs, using other criteria in addition to peer judgment.

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[9] Dolan, p. 81.

[10] For a discussion of these criticisms, see David S. Webster, "Methods of Assessing Quality," Change, October 1981, pp. 20-24.

> Though carefully done and useful in a number of ways, these ratings (Cartter and Roose-Andersen) have been criticized for their failure to reflect the complexity of graduate programs, their tendency to emphasize the traditional values that are highly related to program size and wealth, and their lack of timeliness or currency. Rather than repeat such ratings, many members of the graduate community have voiced a preference for developing ways to assess the quality of graduate programs that would be more comprehensive, sensitive to the different program purposes, and appropriate for use at any time by individual departments or universities.[11]

Several attempts have been made to go beyond the reputational assessment. Clark, Harnett, and Baird, in a pilot study[12] of graduate programs in chemistry, history, and psychology, identified as many as 30 possible measures significant for assessing the quality of graduate education. Glower[13] has ranked engineering schools according to the total amount of research spending and the number of graduates listed in Who's Who in Engineering. House and Yeager[14] rated economics departments on the basis of the total number of pages published by full professors in 45 leading journals in this discipline. Other ratings based on faculty publication records have been compiled for graduate programs in a variety of disciplines, including political science, psychology, and sociology. These and other studies demonstrate the feasibility of a national assessment of graduate programs that is founded on more than reputational standing among faculty peers.

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[11] Clark, p. 1.

[12] M. J. Clark, R. T. Harnett, and L. L. Baird, Assessing Dimensions of Quality in Doctoral Education: A Technical Report of a National Study in Three Fields, Educational Testing Service, Princeton, New Jersey, 1976.

[13] Donald D. Glower, "A Rational Method for Ranking Engineering Programs," Engineering Education, May 1980.

[14] Donald R. House and James H. Yeager, Jr., "The Distribution of Publication Success Within and Among Top Economics Departments: A Disaggregate View of Recent Evidence," Economic Inquiry, Vol. 16, No. 4, October 1978, pp. 593-598.

DEVELOPMENT OF STUDY PLANS

In September 1976 the Conference Board, with support from the Carnegie Corporation of New York and the Andrew W. Mellon Foundation, convened a three-day meeting to consider whether a study of programs in graduate education should be undertaken. The 40 invited participants at this meeting included academic administrators, faculty members, and agency and foundation officials,[15] who represented a variety of institutions, disciplines, and convictions. In these discussions there was considerable debate concerning whether the potential benefits of such a study outweighed the possible misrepresentations of the results. On the one hand, "a substantial majority of the Conference [participants believed] that the earlier assessments of graduate education have received wide and important use: by students and their advisors, by the institutions of higher education as aids to planning and the allocation of educational functions, as a check on unwarranted claims of excellence, and in social science research."[16] On the other hand, the conference participants recognized that a new study assessing the quality of graduate education "would be conducted and received in a very different atmosphere than were the earlier Cartter and Roose-Andersen reports. . . . Where ratings were previously used in deciding where to increase funds and how to balance expanding programs, they might now be used in deciding where to cut off funds and programs."

After an extended debate of these issues, it was the recommendation of this conference that a study with particular emphasis on the effectiveness of doctoral programs in educating research personnel be undertaken. The recommendation was based principally on four considerations:

(1) the importance of the study results to national and state bodies,
(2) the desire to stimulate continuing emphasis on quality in graduate education,
(3) the need for current evaluations that take into account the many changes that have occurred in programs since the Roose-Andersen study, and
(4) the value of extending the range of measures used in evaluative studies of graduate programs.

Although many participants expressed interest in an assessment of master's degree and professional degree programs, insurmountable problems prohibited the inclusion of these types of programs in this study.

Following this meeting a 13-member committee,[17] co-chaired by

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[15] See Appendix G for a list of the participants in this conference.
[16] From a summary of the Woods Hole Conference (see Appendix G).
[17] See Appendix H for a list of members of the planning committee.

Gardner Lindzey and Harriet A. Zuckerman, was formed to develop a detailed plan for a study limited to research-doctorate programs and designed to improve upon the methodologies utilized in earlier studies. In its deliberations the planning committee carefully considered the criticisms of the Roose-Andersen study and other national assessments. Particular attention was paid to the feasibility of compiling a variety of specific measures (e.g., faculty publication records, quality of students, program resources) that were judged to be related to the quality of research-doctorate programs. Attention was also given to making improvements in the survey instrument and procedures used in the Cartter and Roose-Andersen studies. In September 1978 the planning group submitted a comprehensive report describing alternative strategies for an evaluation of the quality and effectiveness of research-doctorate programs.

> The proposed study has its own distinctive features. It is characterized by a sharp focus and a multidimensional approach. (1) It will focus only on programs awarding research doctorates; other purposes of doctoral training are acknowledged to be important, but they are outside the scope of the work contemplated. (2) The multidimensional approach represents an explicit recognition of the limitations of studies that make assessments solely in terms of ratings of perceived quality provided by peers--the so-called reputational ratings. Consequently, a variety of quality-related measures will be employed in the proposed study and will be incorporated in the presentation of the results of the study.[18]

This report formed the basis for the decision by the Conference Board to embark on a national assessment of doctorate-level programs in the sciences, engineering, and the humanities.

In June 1980 an 18-member committee was appointed to oversee the study. The committee,[19] made up of individuals from a diverse set of disciplines within the sciences, engineering, and the humanities, includes seven members who had been involved in the planning phase and several members who presently serve or have served as graduate deans at either public or private universities. During the first eight months the committee met three times to review plans for the study activities, make decisions on the selection of disciplines and programs to be covered, and design the survey instruments to be used. Early in the study an effort was made to solicit the views of presidents and graduate deans at more than 250 universities. Their suggestions were most helpful to the committee in drawing up final plans for the assessment. With the assistance of the Council of Graduate Schools in the United States, the committee and its staff have tried to keep the graduate deans informed about the progress being made in this study. The final section of this chapter describes the procedures followed in determining which research-doctorate programs were to be included in the assessment.

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[18] National Research Council, A Plan to Study the Quality and Effectiveness of Research-Doctorate Programs, 1978 (unpublished report).

[19] See p. iii of this volume for a list of members of the study committee.

SELECTION OF DISCIPLINES AND PROGRAMS TO BE EVALUATED

One of the most difficult decisions made by the study committee was the selection of disciplines to be covered in the assessment. Early in the planning stage it was recognized that some important areas of graduate education would have to be left out of the study. Limited financial resources required that efforts be concentrated on a total of no more than about 30 disciplines in the biological sciences, engineering, humanities, mathematical and physical sciences, and social sciences. At its initial meeting the committee decided that the selection of disciplines within each of these five areas should be made primarily on the basis of the total number of doctorates awarded nationally in recent years.

At the time the study was undertaken, aggregate counts of doctoral degrees earned during the FY1976-78 period were available from two independent sources--the Educational Testing Service (ETS) and the National Research Council (NRC). Table 1.1 presents doctoral awards data for 10 disciplines within the mathematical and physical sciences. As alluded to in footnote 1 of the table, discrepancies between the ETS and NRC counts may be explained, in part, by differences in the data collection procedures. The ETS counts, derived from information provided by universities, have been categorized according to the discipline of the department/academic unit in which the degree was earned. The NRC counts were tabulated from the survey responses of FY1976-78 Ph.D. recipients, who had been asked to identify their fields of specialty. Since separate totals for research doctorates in astronomy, atmospheric sciences, environmental sciences, and marine sciences were not available from the ETS manual, the committee made its selection of six disciplines primarily on the basis of the NRC data. In the case of computer sciences, some consideration was given to the fact that the ETS estimate was significantly greater than the NRC estimate.[20]

The selection of the research-doctorate programs to be evaluated in each discipline was made in two stages. Programs meeting any of the following three criteria were initially nominated for inclusion in the study:

(1) more than a specified number (see below) of
research doctorates awarded during the
FY1976-78 period,

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[20] See footnote 4 in Table 1.1.

(2) more than one-third of that specified number of doctorates awarded in FY1979, or
(3) an average rating of 2.0 or higher in the Roose-Andersen rating of the scholarly quality of departmental faculty.

In each discipline the specified number of doctorates required for inclusion in the study was determined in such a way that the programs meeting this criterion accounted for at least 90 percent of the

TABLE 1.1 Number of Research Doctorates Awarded in the Mathematical and Physical Science Disciplines, FY1976-78

	Source of Data[1]	
	ETS	NRC
Disciplines Included in the Assessment		
Chemistry	4,624	4,739
Physics[2]	3,139	3,033
Mathematics	1,985	1,848
Geosciences[3]	1,395	1,139
Computer Sciences[4]	728	456
Statistics/Biostatistics[5]	457	634
Total	12,328	11,849
Disciplines Not Included in the Assessment		
Astronomy	N/A[6]	408
Marine Sciences	N/A	406
Atmospheric Sciences	N/A	246
Environmental Sciences	N/A	160
Other Physical Sciences	N/A	132
Total		1,352

[1] Data on FY1976-78 doctoral awards were derived from two independent sources: Educational Testing Service (ETS), Graduate Programs and Admissions Manual, 1979-81, and NRC's Survey of Earned Doctorates, 1976-78. Differences in field definitions account for discrepancies between the ETS and NRC data.

[2] Data from ETS include doctorates in astronomy and astrophysics.

[3] Data from ETS include doctorates in atmospheric sciences and oceanography.

[4] The ETS data may include some individuals from computer science departments who earned doctorates in the field of electrical engineering and consequently are not included in the NRC data.

[5] Data from ETS exclude doctorates in biostatistics.

Not available.

doctorates awarded in that discipline during the FY1976-78 period. In the mathematical and physical science disciplines, the following numbers of FY1976-78 doctoral awards were required to satisfy the first criterion (above):

Chemistry--13 or more doctorates
Computer Sciences--5 or more doctorates
Geosciences--7 or more doctorates
Mathematics--7 or more doctorates
Physics--10 or more doctorates
Statistics/Biostatistics--5 or more doctorates

A list of the nominated programs at each institution was then sent to a designated individual (usually the graduate dean) who had been appointed by the university president to serve as study coordinator for the institution. The coordinator was asked to review the list and eliminate any programs no longer offering research doctorates or not belonging in the designated discipline. The coordinator also was given an opportunity to nominate additional programs that he or she believed should be included in the study.[21] Coordinators were asked to restrict their nominations to programs that they considered to be "of uncommon distinction" and that had awarded no fewer than two research doctorates during the past two years. In order to be eligible for inclusion, of course, programs had to belong in one of the disciplines covered in the study. If the university offered more than one research-doctorate program in a discipline, the coordinator was instructed to provide information on each of them so that these programs could be evaluated separately.

The committee received excellent cooperation from the study coordinators at the universities. Of the 243 institutions that were identified as having one or more research-doctorate programs satisfying the criteria (listed earlier) for inclusion in the study, only 7 declined to participate in the study and another 8 failed to provide the program information requested within the three-month period allotted (despite several reminders). None of these 15 institutions had doctoral programs that had received strong or distinguished reputational ratings in prior national studies. Since the information requested had not been provided, the committee decided not to include programs from these institutions in any aspect of the assessment. In each of the six chapters that follows, a list is given of the universities that met the criteria for inclusion in a particular discipline but that are not represented in the study.

As a result of nominations by institutional coordinators, some programs were added to the original list and others dropped. Table 1.2 reports the final coverage in each of the six mathematical and physical science disciplines. The number of programs evaluated varies

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[21] See Appendix A for the specific instructions given to the coordinators.

TABLE 1.2 Number of Programs Evaluated in Each Discipline and the Total FY1976-80 Doctoral Awards from These Programs

Discipline	Programs	FY1976-80 Doctorates*
Chemistry	145	7,304
Computer Sciences	58	1,154
Geosciences	91	1,747
Mathematics	115	2,698
Physics	123	4,271
Statistics/Biostatistics	64	906
TOTAL	596	18,080

*The data on doctoral awards were provided by the study coordinator at each of the universities covered in the assessment.

considerably by discipline. A total of 145 chemistry programs have been included in the study; in computer sciences and statistics/biostatistics fewer than half this number have been included. Although the final determination of whether a program should be included in the assessment was left in the hands of the institutional coordinator, it is entirely possible that a few programs meeting the criteria for inclusion in the assessment were overlooked by the coordinators. During the course of the study only two such programs in the mathematical and physical sciences--one in mathematics and one in biostatistics--have been called to the attention of the committee.

In the chapter that follows, a detailed description is given of each of the measures used in the evaluation of research-doctorate programs in the mathematical and physical sciences. The description includes a discussion of the rationale for using the measure, the source from which data for that measure were derived, and any known limitations that would affect the interpretation of the data reported. The committee wishes to emphasize that there are limitations associated with each of the measures and that none of the measures should be regarded as a precise indicator of the quality of a program in educating scientists for careers in research. The reader is strongly urged to consider the descriptive material presented in Chapter II before attempting to interpret the program evaluations reported in subsequent chapters. In presenting a frank discussion of any shortcomings of each measure, the committee's intent is to reduce the possibility of misuse of the results from this assessment of research-doctorate programs.

II

Methodology

> Quality . . . you know what it is, yet you don't know what it is. But that's self-contradictory. But some things are better than others, that is, they have more quality. But when you try to say what the quality is, apart from the things that have it, it all goes poof! There's nothing to talk about. But if you can't say what Quality is, how do you know what it is, or how do you know that it even exists? If no one knows what it is, then for all practical purposes it doesn't exist at all. But for all practical purposes it really does exist. What else are the grades based on? Why else would people pay fortunes for some things and throw others in the trash pile? Obviously some things are better than others . . . but what's the "betterness"? . . . So round and round you go, spinning mental wheels and nowhere finding anyplace to get traction. What the hell is Quality? What is it?
>
> Robert M. Pirsig
> Zen and the Art of
> Motorcycle Maintenance

Both the planning committee and our own study committee have given careful consideration to the types of measures to be employed in the assessment of research-doctorate programs.[1] The committees recognized that any of the measures that might be used is open to criticism and that no single measure could be expected to provide an entirely satisfactory index of the quality of graduate education. With respect to the use of multiple criteria in educational assessment, one critic has commented:

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[1] A description of the measures considered may be found in the third chapter of the planning committee's report, along with a discussion of the relative merits of each measure.

> At best each is a partial measure encompassing a fraction of the large concept. On occasion its link to the real [world] is problematic and tenuous. Moreover, each measure [may contain] a load of irrelevant superfluities, "extra baggage" unrelated to the outcomes under study. By the use of a number of such measures, each contributing a different facet of information, we can limit the effect of irrelevancies and develop a more rounded and truer picture of program outcomes.[2]

Although the use of multiple measures alleviates the criticisms directed at a single dimension or measure, it certainly will not satisfy those who believe that the quality of graduate programs cannot be represented by quantitative estimates no matter how many dimensions they may be intended to represent. Furthermore, the usefulness of the assessment is dependent on the validity and reliability of the criteria on which programs are evaluated. The decision concerning which measures to adopt in the study was made primarily on the basis of two factors:

(1) the extent to which a measure was judged to be related to the quality of research-doctorate programs, and
(2) the feasibility of compiling reliable data for making national comparisons of programs in particular disciplines.

Only measures that were applicable to a majority of the disciplines to be covered were considered. In reaching a final decision the study committee found the ETS study,[3] in which 27 separate variables were examined, especially helpful, even though it was recognized that many of the measures feasible in institutional self-studies would not be available in a national study. The committee was aided by the many suggestions received from university administrators and others within the academic community.

Although the initial design called for an assessment based on approximately six measures, the committee concluded that it would be highly desirable to expand this effort. A total of 16 measures (listed in Table 2.1) have been utilized in the assessment of research-doctorate programs in chemistry, computer sciences, geosciences, mathematics, and physics; 15 of these were used in evaluating programs in statistics/biostatistics. (Data on research expenditures are unavailable in the latter discipline.) For nine of the measures

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[2] C. H. Weiss, Evaluation Research: Methods of Assessing Program Effectiveness, Prentice-Hall, Inc., Englewood Cliffs, New Jersey, 1972, p. 56.

[3] See M. J. Clark et al. (1976) for a description of these variables.

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MEASURES COMPILED ON INDIVIDUAL RESEARCH-DOCTORATE PROGRAMS

Program Size[1] (See pages 16-17.)

01 Reported number of faculty members in the program, December 1980.

02 Reported number of program graduates in last five years (July 1975 through June 1980).

03 Reported total number of full-time and part-time graduate students enrolled in the program who intend to earn doctorates, December 1980.

Characteristics of Graduates[2] (See pages 17-20.)

04 Fraction of FY1975-79 program graduates who had received some national fellowship or training grant support during their graduate education.

05 Median number of years from first enrollment in graduate school to receipt of the doctorate--FY1975-79 program graduates.[3]

06 Fraction of FY1975-79 program graduates who at the time they completed requirements for the doctorate reported that they had made definite commitments for postgraduation employment.

07 Fraction of FY1975-79 program graduates who at the time they completed requirements for the doctorate reported that they had made definite commitments for postgraduation employment in Ph.D.-granting universities.

Reputational Survey Results[4] (See pages 20-25.)

08 Mean rating of the scholarly quality of program faculty (scale = 0 to 5).

09 Mean rating of the effectiveness of the program in educating research scholars/scientists (scale = 0 to 3).

10 Mean rating of the improvement in program quality in the last five years (scale = 0 to 2).

11 Mean rating of the evaluators' familiarity with the work of program faculty (scale = 0 to 2).

University Library Size[5] (See pages 25-26.)

12 Composite index describing the library size in the university in which the program is located, 1979-80 (scale = -3 to +3).

Research Support (See pages 26-27.)

13 Fraction of program faculty members holding research grants from the National Science Foundation, National Institutes of Health, or the Alcohol, Drug Abuse, and Mental Health Administration at any time during the FY1978-80 period.[6]

14 Total expenditures reported by the university for research and development activities in a specified field, FY1979[7] (in thousands of dollars).

Publication Records[8] (See pages 27-29.)

15 Number of published articles attributed to the program, 1978-79.

16 Estimated "overall influence" of published articles attributed to the program, 1978-79 (raw values are not reported).

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[1] Based on information provided to the committee by the participating universities.

[2] Based on data compiled in the NRC's Survey of Earned Doctorates.

[3] In reporting standardized scores and correlations with other variables, a shorter time-to-Ph.D. is assigned a higher score.

[4] Based on responses to the committee's survey conducted in April 1981.

[5] Based on data compiled by the Association of Research Libraries.

[6] Based on matching faculty names provided by institutional coordinators with the names of research grant awardees from the three federal agencies.

[7] Based on data provided to the National Science Foundation by universities.

[8] Based on data compiled by the Institute for Scientific Information and developed by Computer Horizons, Inc.

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TABLE 2.1 Measures Compiled on Individual Research-Doctorate Programs

Program Size[1]

01 Reported number of faculty members in the program, December 1980.
02 Reported number of program graduates in last five years (July 1975 through June 1980).
03 Reported total number of full-time and part-time graduate students enrolled in the program who intend to earn doctorates, December 1980.

Characteristics of Graduates[2]

04 Fraction of FY1975-79 program graduates who had received some national fellowship or training grant support during their graduate education.
05 Median number of years from first enrollment in graduate school to receipt of the doctorate--FY1975-79 program graduates.[3]
06 Fraction of FY1975-79 program graduates who at the time they completed requirements for the doctorate reported that they had made definite commitments for postgraduation employment.
07 Fraction of FY1975-79 program graduates who at the time they completed requirements for the doctorate reported that they had made definite commitments for postgraduation employment in Ph.D.-granting universities.

Reputational Survey Results[4]

08 Mean rating of the scholarly quality of program faculty.
09 Mean rating of the effectiveness of the program in educating research scholars/scientists
10 Mean rating of the improvement in program quality in the last five years.
11 Mean rating of the evaluators' familiarity with the work of program faculty.

University Library Size[5]

12 Composite index describing the library size in the university in which the program is located, 1979-80.

Research Support

13 Fraction of program faculty members holding research grants from the National Science Foundation; National Institutes of Health; or the Alcohol, Drug Abuse, and Mental Health Administration at any time during the FY1978-80 period.[6]
14 Total expenditures (in thousands of dollars) reported by the university for research and development activities in a specified field, FY1979.[7]

Publication Records[8]

15 Number of published articles attributed to the program, 1978-79.
16 Estimated "overall influence" of published articles attributed to the program, 1978-79.

[1] Based on information provided to the committee by the participating universities.
[2] Based on data compiled in the NRC's Survey of Earned Doctorates.
[3] In reporting standardized scores and correlations with other variables, a shorter time-to-Ph.D. is assigned a higher score.
[4] Based on responses to the committee's survey conducted in April 1981.
[5] Based on data compiled by the Association of Research Libraries.
[6] Based on matching faculty names provided by institutional coordinators with the names of research grant awardees from the three federal agencies.
[7] Based on data provided to the National Science Foundation by universities.
[8] Based on data compiled by the Institute for Scientific Information and developed by Computer Horizons, Inc.

data are available describing most, if not all, of the mathematical and physical science programs included in the assessment. For seven measures the coverage is less complete but encompasses at least a majority of the programs in every discipline. The actual number of programs evaluated on every measure is reported in the second table in each of the next six chapters.

The 16 measures describe a variety of aspects important to the operation and function of research-doctorate programs--and thus are relevant to the quality and effectiveness of programs in educating scientists for careers in research. However, not all of the measures may be viewed as "global indices of quality." Some, such as those relating to program size, are best characterized as "program descriptors" which, although not dimensions of quality per se, are thought to have a significant influence on the effectiveness of programs. Other measures, such as those relating to university library size and support for research and training, describe some of the resources generally recognized as being important in maintaining a vibrant program in graduate education. Measures derived from surveys of faculty peers or from the publication records of faculty members, on the other hand, have traditionally been regarded as indices of the overall quality of graduate programs. Yet these too are not true measures of quality.

> We often settle for an easy-to-gather statistic, perfectly legitimate for its own limited purposes, and then forget that we haven't measured what we want to talk about. Consider, for instance, the reputation approach of ranking graduate departments: We ask a sample of physics professors (say) which the best physics departments are and then tabulate and report the results. The "best" departments are those that our respondents say are the best. Clearly it is useful to know which are the highly regarded departments in a given field, but _prestige_ (which is what we are measuring here) isn't exactly the same as _quality_.*

To be sure, each of the 16 measures reported in this assessment has its own set of limitations. In the sections that follow an explanation is provided of how each measure has been derived and its particular limitations as a descriptor of research-doctorate programs.

PROGRAM SIZE

Information was collected from the study coordinators at each university on the names and ranks of program faculty, doctoral student enrollment, and number of Ph.D. graduates in each of the past five years (FY1976-80). Each coordinator was instructed to include on the faculty list those individuals who, as of December 1, 1980, held academic appointments (typically at the rank of assistant, associate, and full professor) and who participated significantly in doctoral education. Emeritus and adjunct members generally were not to be included. Measure 01 represents the number of faculty identified in a program. Measure 02 is the reported number of graduates who earned Ph.D. or equivalent research doctorates in a program during the period from July 1, 1975, through June 30, 1980. Measure 03 represents the total number of full-time and part-time students reported to be enrolled in a program in the fall of 1980, who intended to earn research doctorates. All three of these measures describe different aspects of program size. In previous studies program size has been shown to be highly correlated with the reputational ratings of a program, and this relationship is examined in detail in this report. It should be noted that since the information was provided by the institutions participating in the study, the data may be influenced by the subjective decisions made by the individuals completing the forms. For example, some institutional coordinators may be far less restrictive than others in deciding who should be included on the list of program faculty. To minimize variation in interpretation, detailed instructions were provided to those filling out the forms.[5] Measure 03 is of particular concern in this regard since the coordinators at some institutions may not have known how many of the students currently enrolled in graduate study intended to earn doctoral degrees.

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*John Shelton Reed, "How Not to Measure What a University Does," _The Chronicle of Higher Education_, Vol 22, No. 12, May 11, 1981, p. 56.

CHARACTERISTICS OF GRADUATES

One of the most meaningful measures of the success of a research-doctorate program is the performance of its graduates. How many go on to lead productive careers in research and/or teaching? Unfortunately, reliable information on the subsequent employment and career achievements of the graduates of individual programs is not available. In the absence of this directly relevant information, the committee has relied on four indirect measures derived from data compiled in the NRC's Survey of Earned Doctorates.[6] Although each measure has serious limitations (described below), the committee believes it more desirable to include this information than not to include data about program graduates.

In identifying program graduates who had received their doctorates in the previous five years (FY1975-79),[7] the faculty lists furnished by the study coordinators at universities were compared with the names of dissertation advisers (available from the NRC survey). The latter source contains records for virtually all individuals who have earned research doctorates from U.S. universities since 1920. The institution, year, and specialty field of Ph.D. recipients were also used in determining the identity of program graduates. It is estimated that this matching process provided information on the graduate training and employment plans of more than 90 percent of the FY1975-79 graduates from the mathematical and physical science programs. In the calculation of each of the four measures derived from the NRC survey, program data are reported only if the survey information is available on at least 10 graduates. Consequently, in the disciplines with smaller programs--computer sciences and statistics/biostatistics--only slightly more than half the programs are included in these measures, whereas more than 90 percent of the chemistry and physics programs are included.

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[5] A copy of the survey form and instructions sent to study coordinators is included in Appendix A.

[6] A copy of the questionnaire used in this survey is found in Appendix B.

[7] Survey data for the FY1980 Ph.D. recipients had not yet been compiled at the time this assessment was undertaken.

Measure 04 constitutes the fraction of FY1975-79 graduates of a program who had received at least some national fellowship support, including National Institutes of Health (NIH) fellowships or traineeships, National Science Foundation (NSF) fellowships, other federal fellowships, Woodrow Wilson fellowships, or fellowships/traineeships from other U.S. national organizations. One might expect the more selective programs to have a greater proportion of students with national fellowship support--especially "portable fellowships." Although the committee considered alternative measures of student ability (e.g., Graduate Record Examination scores, undergraduate grade point averages), reliable information of this sort was unavailable for a national assessment. It should be noted that the relevance of the fellowship measure varies considerably among disciplines. In the biomedical sciences a substantial fraction of the graduate students are supported by training grants and fellowships; in the mathematical and physical sciences the majority are supported by research assistantships and teaching assistantships.

Measure 05 is the median number of years elapsed from the time program graduates first enrolled in graduate school to the time they received their doctoral degrees. For purposes of analysis the committee has adopted the conventional wisdom that the most talented students are likely to earn their doctoral degrees in the shortest periods of time--hence, the shorter the median time-to-Ph.D., the higher the standardized score that is assigned. Although this measure has frequently been employed in social science research as a proxy for student ability, one must regard its use here with some skepticism. It is quite possible that the length of time it takes a student to complete requirements for a doctorate may be significantly affected by the explicit or implicit policies of a university or department. For example, in certain cases a short time-to-Ph.D. may be indicative of less stringent requirements for the degree. Furthermore, previous studies have demonstrated that women and members of minority groups, for reasons having nothing to do with their abilities, are more likely than male Caucasians to interrupt their graduate education or to be enrolled on a part-time basis.[8] As a consequence, the median time-to-Ph.D. may be longer for programs with larger fractions of women and minority students.

Measure 06 represents the fraction of FY 1975-79 program graduates who reported at the time they had completed requirements for the doctorate that they had signed contracts or made firm commitments for postgraduation employment (including postdoctoral appointments as well as other positions in the academic or nonacademic sectors) and who provided the names of their prospective employers. Although this measure is likely to vary by discipline according to the availability of employment opportunities, a program's standing relative to other programs in the same discipline should not be affected by this variation. In theory, the graduates with the greatest promise should have the easiest time finding jobs. However, the measure is also influenced by a variety of other factors, such as personal job preferences and restrictions in geographic mobility, that are unrelated to the ability of the individual. It also should be noted parenthetically that unemployment rates for doctoral recipients are quite low and that nearly all of the graduates seeking jobs find positions soon after completing their doctoral programs.[9] Furthermore, first employment after graduation is by no means a measure of career achievement, which is what one would like to have if reliable data were available.

Measure 07, a variant of measure 06, constitutes the fraction of FY1975-79 program graduates who indicated that they had made firm commitments for employment in Ph.D.-granting universities and who provided the names of their prospective employers. This measure may be presumed to be an indication of the fraction of graduates likely to pursue careers in academic research, although there is no evidence concerning how many of them remain in academic research in the long term. In many science disciplines the path from Ph.D. to postdoctoral apprenticeship to junior faculty has traditionally been regarded as the road of success for the growth and development of research talent. The committee is well aware, of course, that other paths, such as employment in the major laboratories of industry and government, provide equally attractive opportunities for growth. Indeed, in recent years increasing numbers of graduates are entering the nonacademic sectors. Unfortunately, the data compiled from the NRC's Survey of Earned Doctorates do not enable one to distinguish between employment in the top-flight laboratories of industry and

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[8] For a detailed analysis of this subject, see Dorothy M. Gilford and Joan Snyder, Women and Minority Ph.D.'s in the 1970's: A Data Book, National Academy of Sciences, Washington, D.C., 1977.

[9] For new Ph.D. recipients in science and engineering the unemployment rate has been less than 2 percent (see National Research Council, Postdoctoral Appointments and Disappointments, National Academy Press, Washington, D.C., 1981, p. 313).

TABLE 2.2 Percentage of FY1975-79 Doctoral Recipients with Definite Commitments for Employment Outside the Academic Sector*

Chemistry	45
Computer Sciences	38
Geosciences	53
Mathematics	17
Physics	42
Statistics/Biostatistics	29

*Percentages are based on responses to the NRC's Survey of Earned Doctorates by those who indicated that they had made firm commitments for postgraduation employment and who provided the names of their prospective employers. These percentages may be considered lower-bound estimates of the actual percentages of doctoral recipients employed outside the academic sector.

government and employment in other areas of the nonacademic sectors. Accordingly, the committee has relied on a measure that reflects only the academic side and views this measure as a useful and interesting program characteristic rather than a dimension of quality. In disciplines such as geosciences, chemistry, physics, and computer sciences, in which more than one-third of the graduates take jobs outside the academic environs (see Table 2.2), this limitation is of particular concern.

The inclusion of measures 06 and 07 in this assessment has been an issue much debated by members of the committee; the strenuous objections of three committee members regarding the use of these measures are expressed in the Minority Statement that follows Chapter IX.

REPUTATIONAL SURVEY RESULTS

In April 1981, survey forms were mailed to a total of 1,788 faculty members in chemistry, computer sciences, geosciences, mathematics, physics, and statistics/biostatistics. The evaluators were selected from the faculty lists furnished by the study coordinators at the 228 universities covered in the assessment. These evaluators constituted approximately 13 percent of the total faculty population--13,661 faculty members--in the mathematical and physical science programs being evaluated (see Table 2.3). The survey sample was chosen on the basis of the number of faculty in a particular program and the number of doctorates awarded in the previous five years (FY1976-80)--with the stipulation that at least one evaluator was selected from every program covered in the assessment. In selecting the sample each faculty rank was represented in proportion to the total number of individuals holding that rank, and preference was given to those faculty members whom the study coordinators had nominated to serve as evaluators. As shown in Table 2.3, 1,461 individuals, 82 percent of the survey sample in the mathematical and physical sciences, had been recommended by study coordinators.[10]

Each evaluator was asked to consider a stratified random sample of 50 research-doctorate programs in his or her discipline--with programs stratified by the number of faculty members associated with each program. Every program was included on 150 survey forms. The 50 programs to be evaluated appeared on each survey form in random sequence, preceded by an alphabetized list of all programs in that discipline that were being included in the study. No evaluator was asked to consider a program at his or her own institution. Ninety percent of the survey sample group were provided the names of faculty members in each of the 50 programs to be evaluated, along with data on the total number of doctorates awarded in the last five years.[11] The inclusion of this information represents a significant departure from the procedures used in earlier reputational assessments. For purposes of comparison with previous studies, 10 percent (randomly selected in each discipline) were not furnished any information other than the names of the programs.

The survey items were adapted from the form used in the Roose-Andersen study. Prior to mailing, the instrument was pretested using a small sample of faculty members in chemistry and psychology. As a result, two significant improvements were made in the original survey design. A question was added on the extent to which the evaluator was familiar with the work of the faculty in each program. Responses to this question, reported as measure 11, provide some insight into the relationship between faculty recognition and the reputational standing of a program.[12] Also added was a question on the evaluator's field of specialization--thereby making it possible to compare program evaluations in different specialty areas within a particular discipline.

A total of 1,155 faculty members in the mathematical and physical sciences--65 percent of those asked to participate--completed and returned survey forms (see Table 2.3). Two factors probably have contributed to this response rate being approximately 14 percentage points below the rates reported in the Cartter and Roose-Andersen studies. First, because of the considerable expense of printing individualized survey forms (each 25-30 pages), second copies were not sent to sample members not responding to the first mailing[13]--as was done in the Cartter and Roose-Andersen efforts. Second, it is quite apparent that within the academic community there has been a growing dissatisfaction in recent years with educational assessments based on reputational measures. Indeed, this dissatisfaction was an important factor in the Conference Board's decision to undertake a multidimensional assessment, and some faculty members included in the sample made known to the committee their strong objections to the reputational survey.

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[10] A detailed analysis of the survey participants in each discipline is given in subsequent chapters.

[11] This information was furnished to the committee by the study coordinators at the universities participating in the study.

[12] Evidence of the strength of this relationship is provided by correlations presented in Chapters III-VIII, and an analysis of the relationship is provided in Chapter IX.

[13] A follow-up letter was sent to those not responding to the first mailing, and a second copy was distributed to those few evaluators who specifically requested another form.

TABLE 2.3 Survey Response by Discipline and Characteristics of Evaluator

	Total Program Faculty	Survey Sample		
		Total	Respondents	
	N	N	N	%
Discipline of Evaluator				
Chemistry	3,339	435	301	69
Computer Sciences	923	174	108	62
Geosciences	1,419	273	177	65
Mathematics	3,784	348	223	64
Physics	3,399	369	211	57
Statistics/Biostatistics	797	189	135	71
Faculty Rank				
Professor	8,133	1,090	711	65
Associate Professor	3,225	471	293	62
Assistant Professor	2,120	216	143	66
Other	183	11	8	73
Evaluator Selection				
Nominated by Institution	3,751	1,461	971	66
Other	9,910	327	184	56
Survey Form				
With Faculty Names	N/A*	1,609	1,033	64
Without Names	N/A	179	122	68
Total All Fields	13,661	1,788	1,155	65

*Not applicable.

As can be seen in Table 2.3, there is some variation in the response rates in the six mathematical and physical science disciplines. Of particular interest is the relatively high rate of response from chemists and the low rate from physicists--a result consistent with the findings in the Cartter and Roose-Andersen surveys.[14] It is not surprising to find that the evaluators nominated by study coordinators responded more often than did those who had been selected at random. No appreciable differences were found among the response rates of assistant, associate, and full professors or between the rates of those evaluators who were furnished the abbreviated survey form (without lists of program faculty) and those who were given the longer version.

Each program was considered by an average of approximately 90 survey respondents from other programs in the same discipline. The evaluators were asked to judge programs in terms of scholarly quality of program faculty, effectiveness of the program in educating research scholars/scientists, and change in program quality in the last five years.[15] The mean ratings of a program on these three survey items constitute measures 08, 09, and 10. Evaluators were also asked to indicate the extent to which they were familiar with the work of the program faculty. The average of responses to this item constitutes measure 11.

In making judgments about the quality of faculty, evaluators were instructed to consider the scholarly competence and achievements of the individuals. The ratings were furnished on the following scale:

5	Distinguished
4	Strong
3	Good
2	Adequate
1	Marginal
0	Not sufficient for doctoral education
X	Don't know well enough to evaluate

In assessing the effectiveness of a program, evaluators were asked to consider the accessibility of faculty, the curricula, the instructional and research facilities, the quality of the graduate students, the performance of graduates, and other factors that contribute to a program's effectiveness. This measure was rated accordingly:

3	Extremely effective
2	Reasonably effective
1	Minimally effective
0	Not effective
X	Don't know well enough to evaluate

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[14] To compare the response rates obtained in the earlier surveys, see Roose and Andersen, Table 28, p. 29.

[15] A copy of the survey instrument and accompanying instructions are included in Appendix C.

Evaluators were instructed to assess change in program quality on the basis of whether there was an improvement in the last five years in both the scholarly quality of the faculty and the effectiveness in educating research scholars/scientists. The following alternatives were provided:

2 Better than five years ago
1 Little or no change in last five years
0 Poorer than five years ago
X Don't know well enough to evaluate

Evaluators were asked to indicate their familiarity with the work of the program faculty according to the following scale:

2 Considerable familiarity
1 Some familiarity
0 Little or no familiarity

In the computation of mean ratings on measures 08, 09, and 10, the "don't know" responses were ignored. An average program rating based on fewer than 15 responses (excluding the "don't know" responses) is not reported.

Measures 08, 09, and 10 are subject to many of the same criticisms that have been directed at previous reputational surveys. Although care has been taken to improve the sampling design and to provide evaluators with some essential information about each program, the survey results merely reflect a consensus of faculty opinions. As discussed in Chapter I, these opinions may well be based on out-of-date information or be influenced by a variety of factors unrelated to the quality of the program. In Chapter IX a number of factors that may possibly affect the survey results are examined. In addition to these limitations, it should be pointed out that the evaluators, on the average, were unfamiliar with almost one-third of the programs they were asked to consider.[16] As might be expected, the smaller and less prestigious programs were not as well known, and for this reason one might have less confidence in the average ratings of these programs. For all four survey measures, standard errors of the mean ratings are reported; they tend to be larger for the lesser known programs. The frequency of response to each of the survey items is discussed in Chapter IX.

Two additional comments should be made regarding the survey activity. First, it should be emphasized that the ratings derived from the survey reflect a program's standing relative to other programs in the same discipline and provide no basis for making cross-disciplinary comparisons. For example, the fact that a much larger number of chemistry programs received "distinguished" ratings on measure 08 than did computer science programs indicates nothing about the relative quality of faculty in these two disciplines. It may depend, in part, on the total numbers of programs evaluated in these disciplines; in the survey instructions it was suggested to evaluators that no more than 10 percent of the programs listed be designated as "distinguished." Nor is it advisable to compare the rating of a program in one discipline with that of a program in another discipline because the ratings are based on the opinions of different groups of evaluators who were asked to judge entirely different sets of programs. Second, early in the committee's deliberations a decision was made to supplement the ratings obtained from faculty members with ratings from evaluators who hold research-oriented positions in institutions outside the academic sector. These institutions include industrial research laboratories, government research laboratories, and a variety of other research establishments. Over the past 10 years increasing numbers of doctoral recipients have taken positions outside the academic setting. The extensive involvement of these graduates in nonacademic employment is reflected in the percentages reported in Table 2.2: An average of 40 percent of the recent graduates in the mathematical and physical science disciplines who had definite employment plans indicated that they planned to take positions in nonacademic settings. Data from another NRC survey suggest that the actual fraction of scientists employed outside academia may be significantly higher. The committee recognized that the inclusion of nonacademic evaluators would furnish information valuable for assessing nontraditional dimensions of doctoral education and would provide an important new measure not assessed in earlier studies. Results from a survey of this group would provide an interesting comparison with the results obtained from the survey of faculty members. A concentrated effort was made to obtain supplemental funding for adding nonacademic evaluators in selected disciplines to the survey sample, but this effort was unsuccessful. The committee nevertheless remains convinced of the importance of including evaluators from nonacademic research institutions. These institutions are likely to employ increasing fractions of graduates in many disciplines, and it is urged that this group not be overlooked in future assessments of graduate programs.

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[16] See Table 9.6 in Chapter IX.

UNIVERSITY LIBRARY SIZE

The university library holdings are generally regarded as an important resource for students in graduate (and undergraduate) education. The Association of Research Libraries (ARL) has compiled data from its academic member institutions and developed a composite measure of a university library's size relative to those of other ARL members. The ARL Library Index, as it is called, is based on 10 characteristics: volumes held, volumes added (gross), microform units held, current serials received, expenditures for library materials, expenditures for binding, total salary and wage expenditures, other operating expenditures, number of professional staff, and number of nonprofessional staff.[17] The 1979-80 index, which constitutes measure 12, is available for 89 of the 228 universities included in the assessment. (These 89 tend to be among the largest institutions.) The limited coverage of this measure is a major shortcoming. It should be noted that the ARL index is a composite description of library size and not a qualitative evaluation of the collections, services, or operations of the library. Also, it is a measure of aggregate size and does not take into account the library holdings in a particular department or discipline. Finally, although universities with more than one campus were instructed to include figures for the main campus only, some in fact may have reported library size for the entire university system. Whether this misreporting occurred is not known.

RESEARCH SUPPORT

Using computerized data files[18] provided by the National Science Foundation (NSF) and the National Institutes of Health (NIH), it was possible to identify which faculty members in each program had been awarded research grants during the FY1978-80 period by either of these agencies or by the Alcohol, Drug Abuse, and Mental Health Administration (ADAMHA). The fraction of faculty members in a program who had received any research grants from these agencies during this three-year period constitutes measure 13. Since these awards have been made on the basis of peer judgment, this measure is considered to reflect the perceived research competence of program faculty. However, it should be noted that significant amounts of support for research in the mathematical and physical sciences come from other federal agencies as well, but it was not feasible to compile data from these other sources. It is estimated[19] that 55 percent of the university faculty members in these disciplines who received federal R&D funding obtained their support from NSF and another 19 percent from NIH. The remaining 26 percent received support from the Department of Energy, Department of Defense, National Aeronautics and Space Administration, and other federal agencies. It also should be pointed out that only those faculty members who served as principal investigators or co-investigators are counted in the computation of this measure.

Measure 14 describes the total FY1979 expenditures by a university for R&D in a particular discipline. These data have been furnished to the NSF[20] by universities and include expenditures of funds from both federal and nonfederal sources. If an institution has more than one program being evaluated in the same discipline, the aggregate university expenditures for research in that discipline are reported for each of the programs. In each discipline data are recorded for the 100 universities with the largest R&D expenditures. As already mentioned, these data are not available for statistics and biostatistics programs.

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[17] See Appendix D for a description of the calculation of this index.

[18] A description of these files is provided in Appendix E.

[19] Based on special tabulations of data from the NRC's Survey of Doctorate Recipients, 1979.

[20] A copy of the survey instrument used to collect these data appears in Appendix E.

This measure has several limitations related to the procedures by which the data have been collected. The committee notes that there is evidence within the source document[21] that universities employ varying practices for categorizing and reporting expenditures. Apparently, institutional support of research, industrial support of research, and expenditure of indirect costs are reported by different institutions in different categories (or not reported at all). Since measure 14 is based on total expenditures from all sources, the data used here are perturbed only when these types of expenditures are not subsumed under any reporting category. Also, it should be noted that the data being attributed to geosciences programs include university expenditures in all areas of the environmental sciences (geological sciences, atmospheric sciences, and oceanography), and the data for mathematics programs include expenditures in statistics as well as mathematics. In contrast with measure 13, measure 14 is not reported on a scale relative to the number of faculty members and thus reflects the overall level of research activity at an institution in a particular discipline. Although research grants in the sciences and engineering provide some support for graduate students as well, these measures should not be confused with measure 04, which pertains to fellowships and training grants.

PUBLICATION RECORDS

Data from the 1978 and the 1979 Science Citation Index have been compiled[22] on published articles associated with research-doctorate programs. Publication counts were associated with programs on the basis of the discipline of the journal in which an article appeared and the institution with which the author was affiliated. Coauthored articles were proportionately attributed to the institutions of the individual authors. Articles appearing in multidisciplinary journals (e.g., *Science*, *Nature*) were apportioned according to the characteristic mix of subject matter in those journals. For the purposes of assigning publication counts, this mix can be estimated with reasonable accuracy.[23]

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[21] National Science Foundation, *Academic Science: R and D Funds, Fiscal Year 1979*, U.S. Government Printing Office, Washington, D.C., NSF 81-301, 1981.

[22] The publication data have been generated for the committee's use by Computer Horizons, Inc., using source files provided by the Institute for Scientific Information.

[23] Francis Narin, *Evaluative Bibliometrics: The Use of Publications and Citations Analysis in the Evaluation of Scientific Activity*, Report to the National Science Foundation, March 1976, p. 203.

Two measures have been derived from the publication records: measure 15--the total number of articles published in the 1978-79 period that have been associated with a research-doctorate program and measure 16--an estimation of the "influence" of these articles. The latter is a product of the number of articles attributed to a program and the estimated influence of the journals in which these articles appeared. The influence of a journal is determined from the weighted number of times, on the average, an article in that journal is cited--with references from frequently cited journals counting more heavily. A more detailed explanation of the derivation of these measures is given in Appendix F. Neither measure 15 nor measure 16 is based on actual counts of articles written only by program faculty. However, extensive analysis of the "influence" index in the fields of physics, chemistry, and biochemistry has demonstrated the stability of this index and the reliability associated with its use.[24] Of course, this does not imply that the measure captures subtle aspects of publication "influence." It is of interest to note that indices similar to measures 15 and 16 have been shown to be highly correlated with the peer ratings of graduate departments compiled in the Roose-Andersen study.[25]

It must be emphasized that these measures encompass articles (published in selected journals) by _all_ authors affiliated with a given university. Included therefore are articles by program faculty members, students and research personnel, and even members of other departments in that university who publish in those journals. Moreover, these measures do not take into account the differing sizes of programs, and the measures clearly do depend on faculty size. Although consideration was given to reporting the number of published articles _per faculty member_, the committee concluded that since the measure included articles by other individuals besides program faculty members, the aggregate number of articles would be a more reliable measure of overall program quality. It should be noted that if a university had more than one program being evaluated in the same discipline, it is not possible to distinguish the relative contribution of each program. In such cases the aggregate university data in that discipline were assigned to each program.

Since the data are confined to 1978-79, they do not take into account institutional mobility of authors after that period. Thus, articles by authors who have moved from one institution to another since 1979 are credited to the former institution. Also, the publication counts fail to include the contributions of faculty members' publications in journals outside their primary discipline.

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[24] Narin, pp. 283-307.

[25] Richard C. Anderson, Francis Narin, and Paul McAllister, "Publication Ratings Versus Peer Ratings of Universities," _Journal of the American Society for Information Science_, March 1978, pp. 91-103, and Lyle V. Jones, "The Assessment of Scholarship," _New Directions for Program Evaluation_, No. 6, 1980, pp. 1-20.

This point may be especially important for those programs with faculty members whose research is at the intersection of several different disciplines.

The reader should be aware of two additional caveats with regard to the interpretation of measures 15 and 16. First, both measures are based on counts of published articles and do not include books. Since in the mathematical and physical sciences most scholarly contributions are published as journal articles, this may not be a serious limitation. Second, the "influence" measure should not be interpreted as an indicator of the impact of articles by individual authors. Rather it is a measure of the impact of the journals in which articles associated with a particular program have been published. Citation counts, with all their difficulties, would have been preferable since they are attributable to individual authors and they register the impact of books as well as journal articles. However, the difficulty and cost of assembling reliable counts of articles by individual author made their use infeasible.

ANALYSIS AND PRESENTATION OF THE DATA

The next six chapters present all of the information that has been compiled on individual research-doctorate programs in chemistry, computer sciences, geosciences, mathematics, physics, and statistics/biostatistics. Each chapter follows a similar format, designed to assist the reader in the interpretation of program data. The first table in each chapter provides a list of the programs evaluated in a discipline--including the names of the universities and departments or academic units in which programs reside--along with the full set of data compiled for individual programs. Programs are listed alphabetically according to name of institution, and both raw and standardized values are given for all but one measure.[26] For the reader's convenience an insert of information from Table 2.1 is provided that identifies each of the 16 measures reported in the table and indicates the raw scale used in reporting values for a particular measure. Standardized values, converted from raw values to have a mean of 50 and a standard deviation of 10, are computed for every measure so that comparisons can easily be made of a program's relative standing on different measures. Thus, a standardized value of 30 corresponds with a raw value that is two standard deviations below the mean for that measure, and a standardized value of 70 represents a raw value two standard deviations above the mean. While the reporting of values in standardized form is convenient for comparing a particular program's standing on different measures, it may be misleading in interpreting actual differences in the values reported for two or more programs--

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[26] Since the scale used to compute measure 16--the estimated "influence" of published articles--is entirely arbitrary, only standardized values are reported for this measure.

especially when the distribution of the measure being examined is highly skewed. For example, the numbers of published articles (measure 15) associated with four chemistry programs are reported in Table 3.1 as follows:

Program	Raw Value	Standardized Value
A	1	37
B	5	38
C	22	41
D	38	43

Although programs C and D have many times the number of articles as programs A and B, the differences reported on a standardized scale appear to be small. Thus, the reader is urged to take note of the raw values before attempting to interpret differences in the standardized values given for two or more programs.

The initial table in each chapter also presents estimated standard errors of mean ratings derived from the four survey items (measures 08-11). A standard error is an estimated standard deviation of the sample mean rating and may be used to assess the stability of a mean rating reported for a particular program.[27] For example, one may assert (with .95 confidence) that the population mean rating would lie within two standard errors of the sample mean rating reported in this assessment.

No attempt has been made to establish a composite ranking of programs in a discipline. Indeed, the committee is convinced that no single measure adequately reflects the quality of a research-doctorate program and wishes to emphasize the importance of viewing individual programs from the perspective of multiple indices or dimensions.

The second table in each chapter presents summary statistics (i.e., number of programs evaluated, mean, standard deviation, and decile values) for each of the program measures.[28] The reader should find these statistics helpful in interpreting the data reported on individual programs. Next is a table of the intercorrelations among the various measures for that discipline. This table should be of particular interest to those desiring information about the interrelations of the various measures.

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[27] The standard error estimate has been computed by dividing the standard deviation of a program's ratings by the square root of the number of ratings. For a more extensive discussion of this topic, see Fred N. Kerlinger, Foundations of Behavioral Research, Holt, Reinhart, and Winston, Inc., New York, 1973, Chapter 12. Readers should note that the estimate is a measure of the variation in response and by no means includes all possible sources of error.

[28] Standardized scores have been computed from precise values of the mean and standard deviation of each measure and not the rounded values reported in the second table of each chapter.

The remainder of each chapter is devoted to an examination of results from the reputational survey. Included are an analysis of the characteristics of survey participants and graphical portrayals of the relationship of mean rating of scholarly quality of faculty (measure 08) with number of faculty (measure 01) and the relationship of mean rating of program effectiveness (measure 09) with number of graduates (measure 02). A frequently mentioned criticism of the Roose-Andersen and Cartter studies is that small but distinguished programs have been penalized in the reputational ratings because they are not as highly visible as larger programs of comparable quality. The comparisons of survey ratings with measures of program size are presented as the first two figures in each chapter and provide evidence about the number of small programs in each discipline that have received high reputational ratings. Since in each case the reputational rating is more highly correlated with the square root of program size than with the size measure itself, measures 01 and 02 are plotted on a square root scale.[29] To assist the reader in interpreting results of the survey evaluations, each chapter concludes with a graphical presentation of the mean rating for every program of the scholarly quality of faculty (measure 08) and an associated "confidence interval" of 1.5 standard errors. In comparing the mean ratings of two programs, if their reported confidence intervals of 1.5 standard errors do not overlap, one may safely conclude that the program ratings are significantly different (at the .05 level of significance)--i.e., the observed difference in mean ratings is too large to be plausibly attributable to sampling error.[30]

The final chapter of this report gives an overview of the evaluation process in the six mathematical and physical science disciplines and includes a summary of general findings. Particular attention is given to some of the extraneous factors that may influence program ratings of individual evaluators and thereby distort the survey results. The chapter concludes with a number of specific suggestions for improving future assessments of research-doctorate programs.

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[29] For a general discussion of transforming variables to achieve linear fits, see John W. Tukey, Exploring Data Analysis, Addision Wesley, Reading, Massachusetts, 1977.

[30] This rule for comparing nonoverlapping intervals is valid as long as the ratio of the two estimated standard errors does not exceed 2.41. (The exact statistical significance of this criterion then lies between .050 and .034.) Inspection of the standard errors reported in each discipline shows that for programs with mean ratings differing by less than 1.0 (on measure 08), the standard error of one mean very rarely exceeds twice the standard error of another.

III
Chemistry Programs

In this chapter 145 research-doctorate programs in chemistry are assessed. These programs, according to the information supplied by their universities, have accounted for 7,304 doctoral degrees awarded during the FY1976-80 period--approximately 93 percent of the aggregate number of chemistry doctorates earned from U.S. universities in this five-year span.[1] On the average, 75 full-time and part-time students intending to earn doctorates were enrolled in a program in December 1980, with an average faculty size of 23 members.[2] The 145 programs, listed in Table 3.1, represent 143 different universities--the University of Akron and the University of Kansas each have two chemistry programs included in the assessment. All but three of the programs were initiated prior to 1970. In addition to the 143 universities represented in this discipline, another 4 were initially identified as meeting the criteria[3] for inclusion in the assessment:

University of California--San Francisco
Fordham University
Lehigh University
SUNY at Albany

Chemistry programs at these four institutions have not been included in the evaluations in this discipline since in each case the study coordinator either indicated that the institution did not at that time have a research-doctorate program in chemistry or failed to provide the information requested by the committee.

Before examining individual program results presented in Table 3.1, the reader is urged to refer to Chapter II, in which each of the 16 measures used in the assessment is discussed. Summary statistics describing every measure are given in Table 3.2. For all but two measures, data are reported for at least 139 of the 145 chemistry programs. For measure 12, a composite index of the size of a university library, data are available for 87 programs; for measure 14, total university expenditures for research in this discipline, data are available for 95 programs. The programs not evaluated on these two measures are typically smaller--in terms of faculty size and graduate student enrollment--than other chemistry programs. Were data on measures 12 and 14 available for all 145 programs, it is likely that the reported means for these two measures would be appreciably lower (and that some of the correlations of these measures with others would be higher).

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[1] Data from the NRC's Survey of Earned Doctorates indicate that 7,843 research doctorates in chemistry were awarded by U.S. universities between FY1976 and FY1980.

[2] See the reported means for measures 03 and 01 in Table 3.2.

[3] As mentioned in Chapter I, the primary criterion for inclusion was that a university had awarded at least 13 doctorates in chemistry during the FY1976-78 period.

Intercorrelations among the 16 measures (Pearson product-moment coefficients) are given in Table 3.3. Of particular note are the high positive correlations of the measures of program size (01-03) with measures of publication records (15, 16) and reputational survey ratings (08, 09, and 11). Figure 3.1 illustrates the relation between the mean rating of the scholarly quality of faculty (measure 08) and the number of faculty members (measure 01) for each of the 145 programs in chemistry. Figure 3.2 plots the mean rating of program effectiveness (measure 09) against the total number of FY1976-80 program graduates (measure 02). Although in both figures there is a significant positive correlation between program size and reputational rating, it is quite apparent that some of the smaller programs received high mean ratings and that some of the larger programs received low mean ratings.

Table 3.4 describes the 301 faculty members who participated in the evaluation of chemistry programs. These individuals constituted 69 percent of those asked to respond to the survey in this discipline and 9 percent of the faculty population in the 145 research-doctorate programs being evaluated.[4] A majority of the survey participants were organic or physical chemists and held the rank of full professor. Almost three-fourths of them had earned their highest degree prior to 1970.

To assist the reader in interpreting results of the survey evaluations, estimated standard errors have been computed for mean ratings of the scholarly quality of the faculty in 145 chemistry programs (and are given in Table 3.1). For each program the mean rating and an associated "confidence interval" of 1.5 standard errors are illustrated in Figure 3.3 (listed in order of highest to lowest mean rating). In comparing two programs, if their confidence intervals do not overlap, one may safely conclude that there is a significant difference in their mean ratings at a .05 level of significance.[5] From this figure it is also apparent that one should have somewhat more confidence in the accuracy of the mean ratings of higher-rated programs than lower-rated programs. This generalization results primarily from the fact that evaluators are not as likely to be familiar with the less prestigious programs, and consequently the mean ratings of these programs are usually based on fewer survey responses.

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[4] See Table 2.3 in Chapter II.

[5] See pp. 29-31 for a discussion of the interpretation of mean ratings and associated confidence intervals.

TABLE 3.1 Program Measures (Raw and Standardized Values) in Chemistry

Prog No.	University - Department/Academic Unit	Program Size			Characteristics of Program Graduates			
		(01)	(02)	(03)	(04)	(05)	(06)	(07)
001.	Akron, University of	17	18	54	.32	7.1	.87	.17
	Chemistry	*44*	*42*	*47*	*58*	*34*	*60*	*38*
002.	Akron, University of	11	58	102	.39	6.4	.81	.05
	Polymer Science	*38*	*52*	*54*	*64*	*44*	*55*	*30*
003.	Alabama, University of-Tuscaloosa	16	20	31	.31	6.5	.60	.13
	Chemistry	*43*	*43*	*43*	*57*	*42*	*35*	*36*
004.	American University	11	32	49	.11	8.5	.58	.13
	*Chemistry**	*38*	*46*	*46*	*39*	*15*	*33*	*35*
005.	Arizona State University-Tempe	24	45	86	.37	6.4	.75	.38
	Chemistry	*51*	*49*	*52*	*62*	*43*	*49*	*53*
006.	Arizona, University of-Tucson	28	51	92	.22	5.8	.76	.31
	Chemistry	*55*	*50*	*53*	*49*	*52*	*50*	*49*
007.	Arkansas, University-Fayetteville	22	32	28	.34	6.4	.84	.24
	Chemistry	*49*	*46*	*42*	*60*	*44*	*58*	*44*
008.	Atlanta University	8	NA	5	NA	NA	NA	NA
	*Chemistry**	*35*		*39*				
009.	Auburn University	17	10	51	.23	6.0	1.00	.33
	Chemistry	*44*	*41*	*46*	*50*	*49*	*73*	*50*
010.	Baylor University-Waco	12	14	10	.33	5.5	.58	.25
	Chemistry	*39*	*42*	*40*	*59*	*55*	*33*	*44*
011.	Boston College	19	10	17	.33	6.2	.67	.50
	Chemistry	*46*	*41*	*41*	*59*	*46*	*41*	*62*
012.	Boston University	22	28	48	.39	6.4	.58	.31
	Chemistry	*49*	*45*	*46*	*64*	*43*	*33*	*49*
013.	Brandeis University	18	39	60	.15	5.9	.71	.27
	Chemistry	*45*	*47*	*48*	*42*	*50*	*45*	*46*
014.	Brigham Young University	21	21	21	.22	5.5	.77	.39
	Chemistry	*48*	*43*	*41*	*49*	*55*	*51*	*54*
015.	Brown University	23	59	74	.02	5.3	.80	.29
	Chemistry	*50*	*52*	*50*	*31*	*58*	*54*	*47*
016.	Bryn Mawr College	9	10	14	NA	NA	NA	NA
	Chemistry	*36*	*41*	*40*				
017.	CUNY-Graduate School	56	69	90	.03	6.3	.65	.32
	Chemistry	*84*	*54*	*53*	*32*	*45*	*39*	*50*
018.	California Institute of Technology	27	112	171	.55	5.3	.91	.56
	Chemistry and Chemical Engineering	*54*	*64*	*66*	*79*	*58*	*65*	*67*
019.	California, University of-Santa Cruz	12	32	50	.15	5.6	.68	.42
	Chemistry	*39*	*46*	*46*	*43*	*55*	*42*	*56*
020.	California, University of-Berkeley	48	247	359	.21	5.1	.82	.38
	Chemistry	*76*	*95*	*96*	*48*	*61*	*56*	*54*

* indicates program was initiated since 1970.

NOTE: On the first line of data for every program, raw values for each measure are reported; on the second line values are reported in standardized form, with mean = 50 and standard deviation = 10. "NA" indicates that the value for a measure is not available.

TABLE 3.1 Program Measures (Raw and Standardized Values) in Chemistry

Prog No.	Survey Results				University Library	Research Support		Published Articles		Survey Ratings Standard Error			
	(08)	(09)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(08)	(09)	(10)	(11)
001.	1.6	1.1	1.2	0.4	NA	.35	NA	69		.12	.11	.08	.06
	40	*40*	*55*	*39*		*44*		*48*	*42*				
002.	2.3	1.7	1.2	0.2	NA	.55	NA	69		.21	.15	.15	.05
	48	*50*	*55*	*35*		*53*		*48*	*42*				
003.	1.8	1.2	0.9	0.6	-1.3	.25	NA	57		.10	.08	.11	.06
	42	*41*	*45*	*44*	*36*	*39*		*46*	*44*				
004.	0.9	0.7	0.9	0.3	NA	.18	NA	11		.09	.11	.10	.05
	34	*32*	*43*	*36*		*36*		*39*	*40*				
005.	2.5	1.8	1.1	0.7	-0.3	.63	1076	58		.09	.07	.08	.06
	50	*53*	*52*	*47*	*46*	*57*	*44*	*47*	*46*				
006.	2.9	2.0	1.3	1.0	0.9	.54	1269	84		.08	.05	.07	.07
	54	*56*	*62*	*53*	*58*	*53*	*46*	*51*	*49*				
007.	2.1	1.4	1.1	0.6	NA	.55	1180	31		.08	.08	.07	.05
	46	*45*	*51*	*43*		*53*	*45*	*42*	*43*				
008.	0.5	0.3	NA	0.2	NA	NA	852	1		.10	.10	NA	.05
	29	*26*		*34*			*42*	*37*	*39*				
009.	1.4	1.0	1.0	0.4	NA	.12	NA	32		.10	.10	.10	.06
	39	*38*	*45*	*38*		*33*		*42*	*44*				
010.	1.3	1.0	0.8	0.4	NA	.00	NA	31		.13	.10	.10	.06
	38	*37*	*40*	*38*		*27*		*42*	*41*				
011.	1.6	1.0	1.1	0.5	NA	.37	NA	17		.10	.09	.06	.06
	40	*39*	*51*	*42*		*45*		*40*	*41*				
012.	2.0	1.3	1.0	0.7	-0.4	.46	742	23		.08	.08	.08	.06
	45	*45*	*46*	*46*	*46*	*49*	*41*	*41*	*43*				
013.	3.1	2.0	0.9	1.0	NA	.56	769	58		.08	.06	.05	.06
	56	*57*	*44*	*54*		*54*	*41*	*47*	*51*				
014.	2.0	1.4	1.1	0.5	-0.6	.14	775	51		.11	.10	.08	.06
	45	*45*	*51*	*42*	*43*	*34*	*41*	*45*	*44*				
015.	2.9	1.9	0.9	0.9	-1.1	.57	1036	48		.07	.05	.08	.07
	54	*54*	*41*	*50*	*39*	*54*	*44*	*45*	*46*				
016.	1.2	0.8	0.3	0.5	NA	NA	NA	4		.12	.10	.08	.06
	36	*35*	*39*	*41*				*38*	*40*				
017.	2.3	1.4	0.9	0.6	NA	.32	NA	112		.10	.10	.09	.06
	48	*46*	*43*	*44*		*43*		*56*	*52*				
018.	4.9	2.8	1.2	1.8	NA	.82	5297	163		.03	.04	.05	.04
	74	*73*	*56*	*73*		*66*	*80*	*64*	*74*				
019.	2.4	1.6	0.6	0.7	NA	.25	710	38		.10	.08	.09	.07
	48	*49*	*30*	*47*		*39*	*41*	*43*	*45*				
020.	4.9	2.8	1.3	1.9	2.2	.65	3717	205		.03	.04	.05	.03
	74	*72*	*63*	*74*	*72*	*58*	*66*	*71*	*75*				

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TABLE 3.1 Program Measures (Raw and Standardized Values) in Chemistry

Prog		Program Size			Characteristics of Program Graduates			
No.	University - Department/Academic Unit	(01)	(02)	(03)	(04)	(05)	(06)	(07)
021.	California, University of-Davis	32	48	97	.21	5.6	.71	.41
	Chemistry	*59*	*49*	*54*	*48*	*55*	*45*	*56*
022.	California, University of-Irvine	20	39	84	.12	5.1	.78	.25
	Chemistry	*47*	*47*	*52*	*40*	*61*	*52*	*44*
023.	California, University of-Los Angeles	43	142	205	.18	5.6	.80	.34
	Chemistry	*71*	*71*	*71*	*45*	*54*	*54*	*51*
024.	California, University of-Riverside	18	28	44	.27	4.9	.81	.27
	Chemistry	*45*	*45*	*45*	*53*	*64*	*55*	*46*
025.	California, University of-San Diego	31	51	88	.28	5.5	.81	.58
	Chemistry	*58*	*50*	*52*	*54*	*55*	*55*	*68*
026.	California, University of-Santa Barbara	26	63	84	.09	6.6	.79	.43
	Chemistry	*53*	*53*	*52*	*37*	*41*	*53*	*57*
027.	Carnegie-Mellon University	22	32	40	.28	6.5	.87	.17
	Chemistry	*49*	*46*	*44*	*54*	*42*	*60*	*38*
028.	Case Western Reserve University	19	62	55	.19	5.6	.74	.44
	Chemistry	*46*	*53*	*47*	*47*	*54*	*48*	*58*
029.	Catholic University of America	12	23	22	.20	6.3	.65	.22
	Chemistry	*39*	*44*	*41*	*47*	*45*	*40*	*42*
030.	Chicago, University of	28	76	119	.28	5.9	.81	.47
	Chemistry	*55*	*56*	*57*	*54*	*50*	*55*	*60*
031.	Cincinnati, University of	29	39	87	.25	5.6	.81	.47
	Chemistry	*56*	*47*	*52*	*51*	*55*	*55*	*60*
032.	Clark University	9	8	15	NA	NA	NA	NA
	Chemistry	*36*	*40*	*40*				
033.	Clarkson College of Technology	15	23	30	.20	7.0	.73	.15
	Chemistry	*42*	*44*	*43*	*47*	*35*	*47*	*37*
034.	Clemson University	17	17	21	.27	6.0	.80	.33
	Chemistry and Geology	*44*	*42*	*41*	*53*	*49*	*54*	*50*
035.	Colorado State University-Fort Collins	24	40	86	.11	5.6	.89	.57
	Chemistry	*51*	*48*	*52*	*39*	*55*	*63*	*67*
036.	Colorado, University of	53	59	150	.21	5.0	.86	.46
	Chemistry	*81*	*52*	*62*	*48*	*63*	*60*	*59*
037.	Columbia University	17	94	130	.19	5.4	.86	.48
	Chemistry	*44*	*60*	*59*	*46*	*57*	*59*	*61*
038.	Connecticut, University of-Storrs	28	28	32	.15	6.3	.65	.15
	Chemistry	*55*	*45*	*43*	*43*	*44*	*40*	*37*
039.	Cornell University-Ithaca	29	121	153	.36	5.5	.88	.45
	Chemistry	*56*	*66*	*63*	*62*	*56*	*62*	*58*
040.	Delaware, University of-Newark	18	24	98	.22	6.0	.92	.58
	Chemistry	*45*	*44*	*54*	*49*	*49*	*66*	*68*

* indicates program was initiated since 1970.

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TABLE 3.1 Program Measures (Raw and Standardized Values) in Chemistry

Prog No.	Survey Results				University Library	Research Support		Published Articles		Survey Ratings Standard Error			
	(08)	(09)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(08)	(09)	(10)	(11)
021.	3.0	1.9	1.2	1.0	0.6	.30	838	106		.07	.05	.06	.06
	55	*56*	*59*	*54*	*56*	*51*	*42*	*55*	*54*				
022.	3.1	1.9	1.3	1.1	NA	.70	1277	70		.08	.04	.07	.06
	56	*56*	*60*	*56*		*61*	*46*	*49*	*53*				
023.	4.4	2.5	1.3	1.6	2.0	.84	3573	161		.05	.05	.06	.06
	69	*67*	*61*	*68*	*69*	*67*	*65*	*64*	*68*				
024.	2.6	1.6	0.9	0.9	-1.0	.72	626	59		.09	.08	.08	.06
	51	*49*	*42*	*52*	*39*	*62*	*40*	*47*	*49*				
025.	3.7	2.1	1.2	1.2	-0.0	.68	4225	97		.07	.04	.06	.07
	62	*59*	*56*	*59*	*49*	*59*	*71*	*53*	*54*				
026.	3.2	2.0	1.4	1.2	-0.1	.69	1089	93		.07	.05	.06	.06
	57	*56*	*66*	*59*	*48*	*60*	*44*	*52*	*57*				
027.	2.9	1.8	0.8	1.0	NA	.55	1957	62		.08	.06	.07	.06
	54	*53*	*37*	*52*		*53*	*51*	*47*	*45*				
028.	2.8	1.8	0.5	1.0	-1.3	.58	1413	146		.07	.07	.08	.07
	53	*53*	*26*	*53*	*36*	*55*	*47*	*61*	*54*				
029.	1.2	0.9	0.7	0.4	NA	.25	NA	9		.11	.11	.09	.05
	36	*36*	*31*	*39*		*39*		*39*	*40*				
030.	4.4	2.5	0.9	1.6	0.9	.79	3418	84		.06	.06	.06	.06
	69	*67*	*44*	*69*	*58*	*65*	*64*	*51*	*55*				
031.	2.7	1.8	1.1	1.0	-0.2	.31	814	93		.08	.06	.07	.06
	52	*54*	*53*	*53*	*47*	*42*	*42*	*52*	*48*				
032.	1.1	0.7	0.8	0.3	NA	NA	NA	18		.13	.12	.09	.05
	35	*33*	*38*	*37*				*40*	*41*				
033.	1.9	1.4	1.0	0.8	NA	.67	926	59		.11	.08	.06	.07
	44	*46*	*46*	*47*		*59*	*43*	*47*	*43*				
034.	1.4	1.0	1.2	0.6	NA	.35	NA	22		.10	.09	.11	.07
	39	*39*	*56*	*43*		*44*		*41*	*41*				
035.	3.2	1.9	1.7	1.3	-1.1	.63	1774	117		.08	.05	.07	.06
	56	*55*	*80*	*60*	*38*	*57*	*50*	*56*	*54*				
036.	3.3	2.0	1.2	1.2	-0.9	.68	2544	95		.07	.04	.07	.06
	58	*57*	*58*	*58*	*41*	*60*	*56*	*53*	*54*				
037.	4.6	2.7	1.3	1.6	1.7	.94	3531	114		.06	.05	.05	.06
	70	*70*	*60*	*67*	*67*	*72*	*65*	*56*	*62*				
038.	2.1	1.5	1.0	0.5	-0.5	.25	1185	76		.09	.08	.08	.05
	46	*47*	*48*	*42*	*44*	*39*	*45*	*50*	*45*				
039.	4.4	2.5	1.1	1.7	1.6	.72	3414	197		.06	.05	.06	.05
	68	*67*	*53*	*70*	*66*	*62*	*64*	*69*	*77*				
040.	2.5	1.8	1.1	0.8	NA	.28	1015	86		.09	.06	.07	.06
	49	*52*	*50*	*49*		*41*	*43*	*51*	*50*				

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TABLE 3.1 Program Measures (Raw and Standardized Values) in Chemistry

Prog No.	University - Department/Academic Unit	Program Size (01)	Program Size (02)	Program Size (03)	Characteristics of Program Graduates (04)	Characteristics of Program Graduates (05)	Characteristics of Program Graduates (06)	Characteristics of Program Graduates (07)
041.	Denver, University of	13	18	10	NA	NA	NA	NA
	Chemistry	*40*	*42*	*40*				
042.	Drexel University	15	18	35	.07	6.3	.79	.07
	Chemistry	*42*	*42*	*44*	*36*	*45*	*53*	*32*
043.	Duke University	22	69	78	.22	4.9	.79	.41
	Chemistry	*49*	*54*	*51*	*49*	*64*	*53*	*56*
044.	Emory University	16	25	53	.50	5.2	.44	.26
	Chemistry	*43*	*44*	*46*	*74*	*60*	*19*	*45*
045.	Florida State University-Tallahassee	31	54	86	.26	5.7	.83	.45
	Chemistry	*58*	*51*	*52*	*53*	*52*	*57*	*59*
046.	Florida, University of-Gainesville	35	82	130	.14	6.0	.71	.31
	Chemistry	*62*	*57*	*59*	*42*	*49*	*45*	*49*
047.	Georgetown University	14	33	50	.35	5.9	.79	.35
	Chemistry	*41*	*46*	*46*	*61*	*50*	*53*	*52*
048.	Georgia Institute of Technology	24	63	67	.18	5.9	.73	.17
	Chemistry	*51*	*53*	*49*	*46*	*50*	*47*	*39*
049.	Georgia, University of-Athens	21	61	64	.16	5.6	.76	.29
	Chemistry	*48*	*52*	*48*	*43*	*54*	*51*	*47*
050.	Harvard University	24	144	174	.57	5.7	.86	.51
	Chemistry/Chemical Physics	*51*	*72*	*66*	*81*	*53*	*59*	*63*
051.	Hawaii, University of	17	33	26	.07	6.1	.78	.44
	Chemistry	*44*	*46*	*42*	*36*	*47*	*52*	*58*
052.	Houston, University of	23	62	83	.21	5.2	.65	.35
	Chemistry	*50*	*53*	*51*	*48*	*60*	*40*	*51*
053.	Howard University	20	41	40	.54	6.5	.65	.10
	Chemistry	*47*	*48*	*44*	*78*	*42*	*39*	*33*
054.	Idaho, University of-Moscow	12	18	17	.15	5.5	.65	.10
	Chemistry	*39*	*42*	*41*	*43*	*55*	*40*	*34*
055.	Illinois Institute of Technology	15	12	17	.50	5.7	.73	.27
	Chemistry	*42*	*41*	*41*	*74*	*53*	*47*	*46*
056.	Illinois, University of-Chicago Circle	20	50	52	.05	6.8	.68	.45
	Chemistry	*47*	*50*	*46*	*34*	*38*	*43*	*58*
057.	Illinois, University-Urbana/Champaign	43	227	294	.21	5.0	.83	.30
	Chemistry	*71*	*91*	*86*	*48*	*62*	*57*	*48*
058.	Indiana University-Bloomington	36	114	184	.24	5.2	.82	.36
	Chemistry	*63*	*65*	*68*	*51*	*60*	*56*	*52*
059.	Institute of Paper Chemistry-Appleton, Wi	12	31	16	.18	6.0	.77	.00
	Chemistry	*39*	*45*	*40*	*45*	*49*	*51*	*26*
060.	Iowa State University-Ames	33	114	192	.16	5.7	.85	.23
	Chemistry	*60*	*65*	*69*	*44*	*53*	*59*	*43*

* indicates program was initiated since 1970.

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TABLE 3.1 Program Measures (Raw and Standardized Values) in Chemistry

Prog No.	Survey Results				University Library	Research Support		Published Articles		Survey Ratings Standard Error			
	(08)	(09)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(08)	(09)	(10)	(11)
041.	1.4	0.9	1.1	0.4	NA	.46	636	24		.10	.09	.12	.06
	38	*37*	*53*	*40*		*49*	*40*	*41*	*42*				
042.	1.5	1.1	1.1	0.6	NA	.40	NA	30		.10	.10	.09	.07
	39	*40*	*51*	*43*		*46*		*42*	*43*				
043.	2.9	1.9	1.2	0.9	0.3	.64	743	88		.08	.05	.07	.07
	54	*55*	*58*	*50*	*53*	*58*	*41*	*52*	*48*				
044.	2.3	1.6	1.5	0.7	-0.6	.50	NA	33		.10	.08	.09	.07
	47	*49*	*70*	*47*	*43*	*51*		*43*	*44*				
045.	3.3	2.0	1.1	1.2	-0.4	.74	2478	60		.08	.05	.06	.06
	57	*57*	*51*	*58*	*45*	*63*	*56*	*47*	*47*				
046.	3.2	2.0	1.2	1.1	0.8	.34	1968	130		.09	.04	.07	.07
	57	*57*	*56*	*55*	*57*	*44*	*52*	*58*	*52*				
047.	1.9	1.5	1.0	0.5	-0.6	.64	811	27		.11	.08	.06	.06
	44	*47*	*49*	*41*	*43*	*58*	*42*	*42*	*43*				
048.	3.1	1.9	1.2	1.1	NA	.50	3577	74		.08	.05	.07	.06
	55	*55*	*56*	*55*		*51*	*65*	*49*	*47*				
049.	3.0	1.9	1.0	1.1	0.4	.38	1065	126		.07	.05	.08	.07
	55	*54*	*47*	*55*	*54*	*45*	*44*	*58*	*54*				
050.	4.9	2.8	0.8	1.7	3.0	.75	4283	114		.03	.05	.06	.05
	74	*71*	*40*	*71*	*80*	*63*	*71*	*56*	*64*				
051.	2.2	1.5	1.1	0.7	-0.1	.41	NA	64		.08	.07	.07	.06
	47	*48*	*52*	*46*	*48*	*47*		*48*	*51*				
052.	2.6	1.8	1.3	0.9	-0.9	.39	2091	114		.07	.06	.09	.07
	51	*52*	*63*	*51*	*40*	*46*	*53*	*56*	*54*				
053.	1.8	1.2	1.3	0.5	-0.4	.35	756	30		.08	.09	.08	.06
	43	*42*	*62*	*41*	*45*	*44*	*41*	*42*	*41*				
054.	1.6	1.1	1.0	0.6	NA	.33	NA	22		.10	.10	.07	.06
	41	*39*	*49*	*43*		*43*		*41*	*42*				
055.	1.9	1.2	0.6	0.8	NA	.53	NA	36		.09	.09	.08	.06
	43	*42*	*28*	*47*		*53*		*43*	*44*				
056.	2.2	1.5	1.1	0.8	NA	.60	705	43		.08	.08	.07	.06
	47	*48*	*52*	*49*		*56*	*41*	*44*	*47*				
057.	4.5	2.7	1.0	1.7	2.0	.79	3963	222		.06	.05	.07	.04
	69	*69*	*49*	*71*	*69*	*65*	*68*	*74*	*78*				
058.	3.7	2.2	1.3	1.4	0.9	.61	2611	124		.06	.06	.08	.05
	62	*60*	*61*	*64*	*59*	*56*	*57*	*57*	*60*				
059.	1.2	1.2	0.8	0.2	NA	.00	617	3		.18	.12	.10	.04
	36	*41*	*38*	*34*		*27*	*40*	*38*	*39*				
060.	3.6	2.3	1.0	1.3	-0.5	.33	1288	154		.08	.06	.07	.06
	60	*63*	*47*	*61*	*44*	*43*	*46*	*62*	*59*				

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TABLE 3.1 Program Measures (Raw and Standardized Values) in Chemistry

Prog No.	University - Department/Academic Unit	Program Size (01)	Program Size (02)	Program Size (03)	Characteristics of Program Graduates (04)	Characteristics of Program Graduates (05)	Characteristics of Program Graduates (06)	Characteristics of Program Graduates (07)
061.	Iowa, University of-Iowa City	23	50	63	.19	5.4	.69	.37
	Chemistry	*50*	*50*	*48*	*46*	*57*	*44*	*53*
062.	Johns Hopkins University	18	55	50	.31	5.3	.84	.53
	Chemistry	*45*	*51*	*46*	*57*	*59*	*58*	*64*
063.	Kansas State University-Manhattan	18	22	50	.33	6.4	.85	.05
	Chemistry	*45*	*43*	*46*	*59*	*43*	*59*	*30*
064.	Kansas, University of	20	41	49	.10	5.7	.88	.35
	Chemistry	*47*	*48*	*46*	*38*	*53*	*62*	*51*
065.	Kansas, University of	9	14	28	.07	5.5	.93	.07
	Pharmaceutical Chemistry	*36*	*42*	*42*	*35*	*55*	*66*	*32*
066.	Kent State University	24	25	35	.15	7.2	.76	.40
	Chemistry	*51*	*44*	*44*	*43*	*33*	*50*	*55*
067.	Kentucky, University of	24	14	37	.12	6.0	.81	.38
	Chemistry	*51*	*42*	*44*	*40*	*49*	*55*	*53*
068.	Louisiana State University-Baton Rouge	25	41	71	.25	6.0	.63	.21
	Chemistry	*52*	*48*	*49*	*51*	*49*	*37*	*41*
069.	Louisville, University of	17	15	27	.35	7.9	.69	.19
	Chemistry	*44*	*42*	*42*	*61*	*23*	*43*	*40*
070.	Loyola University of Chicago	17	9	NA	.20	8.3	.90	.40
	Chemistry	*44*	*40*		*47*	*18*	*64*	*55*
071.	Maryland, University of-College Park	54	96	180	.17	5.7	.74	.16
	Chemistry	*82*	*60*	*67*	*45*	*53*	*49*	*38*
072.	Massachusetts Institute of Technology	31	163	175	.32	4.4	.70	.22
	Chemistry	*58*	*76*	*66*	*58*	*71*	*45*	*42*
073.	Massachusetts, University of-Amherst	23	81	90	.10	5.5	.79	.20
	Chemistry	*50*	*57*	*53*	*38*	*55*	*53*	*40*
074.	Miami, University of-Florida	16	17	18	.24	5.4	.43	.14
	Chemistry	*43*	*42*	*41*	*51*	*57*	*18*	*37*
075.	Michigan State University-East Lansing	40	142	174	.12	5.4	.78	.32
	Chemistry	*67*	*71*	*66*	*40*	*57*	*52*	*50*
076.	Michigan, University of-Ann Arbor	43	82	103	.22	5.5	.76	.38
	Chemistry	*71*	*57*	*55*	*49*	*55*	*51*	*54*
077.	Minnesota, University of	47	80	153	.26	5.7	.81	.36
	Chemistry	*75*	*57*	*63*	*52*	*53*	*55*	*52*
078.	Missouri, University of-Columbia	16	17	13	.22	4.5	.61	.39
	Chemistry	*43*	*42*	*40*	*49*	*69*	*36*	*54*
079.	Missouri, University of-Kansas City	16	19	38	.25	7.2	NA	NA
	Chemistry	*43*	*43*	*44*	*52*	*33*		
080.	Missouri, University of-Rolla	23	11	18	.07	6.3	.57	.29
	Chemistry	*50*	*41*	*41*	*35*	*44*	*32*	*47*

* indicates program was initiated since 1970.

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TABLE 3.1 Program Measures (Raw and Standardized Values) in Chemistry

Prog	Survey Results				University Library	Research Support		Published Articles		Survey Ratings Standard Error			
No.	(08)	(09)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(08)	(09)	(10)	(11)
061.	2.5	1.7	0.9	0.8	0.3	.48	594	51		.10	.07	.07	.07
	49	*51*	*41*	*49*	*52*	*50*	*40*	*45*	*47*				
062.	3.1	1.9	0.7	1.1	-0.4	.61	1138	54		.08	.06	.06	[illegible]
	56	*56*	*35*	*55*	*45*	*56*	*45*	*46*	*47*				
063.	2.4	1.6	1.3	0.8	NA	.61	NA	49		.09	.07	.08	.06
	49	*49*	*61*	*50*		*56*		*45*	*47*				
064.	2.6	1.8	0.9	0.8	0.1	.40	957	45		.09	.07	.06	.06
	50	*53*	*40*	*47*	*50*	*46*	*43*	*45*	*46*				
065.	1.9	1.6	NA	0.2	0.1	NA	957	42		.27	.22	NA	.04
	44	*50*		*33*	*50*		*43*	*44*	*44*				
066.	1.8	1.4	0.9	0.5	-1.8	.25	NA	45		.09	.09	.09	.05
	43	*45*	*41*	*40*	*31*	*39*		*45*	*44*				
067.	1.8	1.3	1.1	0.7	-0.1	.08	NA	68		.09	.08	.09	.06
	43	*43*	*51*	*45*	*49*	*31*		*48*	*44*				
068.	2.8	1.7	1.0	0.9	-0.3	.40	1161	89		.08	.07	.06	.07
	53	*52*	*46*	*51*	*46*	*46*	*45*	*52*	*54*				
069.	1.4	0.9	0.9	0.3	NA	.29	NA	23		.12	.11	.09	.05
	38	*37*	*44*	*37*		*41*		*41*	*42*				
070.	1.4	1.1	0.9	0.5	NA	.06	NA	16		.12	.10	.07	.06
	38	*39*	*41*	*41*		*30*		*40*	*41*				
071.	2.9	1.9	1.1	1.0	0.2	.52	1907	66		.08	.06	.08	.06
	54	*54*	*51*	*53*	*51*	*52*	*51*	*48*	*46*				
072.	4.8	2.8	1.2	1.7	-0.3	.97	5324	235		.06	.05	.06	.05
	73	*71*	*54*	*71*	*46*	*73*	*80*	*76*	*76*				
073.	2.6	1.9	1.1	0.9	-0.7	.61	2621	201		.08	.06	.05	.06
	51	*55*	*50*	*50*	*42*	*56*	*57*	*70*	*54*				
074.	1.2	0.9	0.9	0.4	NA	.19	NA	27		.12	.10	.11	.06
	37	*35*	*45*	*39*		*36*		*42*	*43*				
075.	3.5	2.1	1.0	1.4	0.3	.50	1491	109		.07	.05	.06	.06
	60	*59*	*45*	*62*	*53*	*51*	*47*	*55*	*57*				
076.	3.3	2.1	0.8	1.4	1.8	.56	1406	150		.08	.05	.07	.06
	58	*58*	*40*	*63*	*67*	*54*	*47*	*62*	*56*				
077.	3.6	2.1	1.4	1.3	1.2	.51	2162	159		.06	.04	.06	.05
	61	*59*	*68*	*61*	*61*	*52*	*53*	*63*	*61*				
078.	1.8	1.1	0.9	0.7	-0.2	.25	NA	54		.09	.08	.09	.06
	42	*40*	*45*	*45*	*47*	*39*		*46*	*44*				
079.	1.6	1.1	1.0	0.4	NA	.19	NA	NA		.11	.10	.08	.06
	40	*40*	*49*	*40*		*36*			*NA*				
080.	1.4	1.0	1.0	0.5	NA	.26	NA	74		.11	.10	.07	.06
	39	*39*	*47*	*42*		*40*		*49*	*48*				

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TABLE 3.1 Program Measures (Raw and Standardized Values) in Chemistry

Prog		Program Size			Characteristics of Program Graduates			
No.	University - Department/Academic Unit	(01)	(02)	(03)	(04)	(05)	(06)	(07)
081.	Montana State University-Bozeman	21	13	20	.44	6.6	.80	.53
	Chemistry	*48*	*41*	*41*	*69*	*40*	*54*	*65*
082.	Nebraska, University of-Lincoln	25	61	94	.21	6.0	.85	.52
	Chemistry	*52*	*52*	*53*	*48*	*48*	*59*	*64*
083.	New Hampshire, University of	15	25	23	.24	5.1	.81	.43
	Chemistry	*42*	*44*	*42*	*51*	*61*	*55*	*57*
084.	New Mexico, University of-Albuquerque	17	32	56	.16	5.9	.84	.39
	Chemistry	*44*	*46*	*47*	*44*	*50*	*58*	*54*
085.	New Orleans, University of	19	23	33	.14	6.0	.82	.14
	Chemistry	*46*	*44*	*43*	*41*	*49*	*56*	*36*
086.	New York University	27	43	60	.24	6.7	.71	.46
	Chemistry	*54*	*48*	*48*	*51*	*39*	*46*	*60*
087.	North Carolina State University-Raleigh	26	21	65	.07	6.5	.79	.28
	Chemistry	*53*	*43*	*48*	*35*	*42*	*53*	*46*
088.	North Carolina, University of-Chapel Hill	30	102	143	.11	4.9	.85	.43
	Chemistry	*57*	*62*	*61*	*39*	*63*	*59*	*58*
089.	North Dakota State University-Fargo	14	18	16	.11	5.2	.89	.06
	Chemistry/Polymers Coatings	*41*	*42*	*40*	*39*	*59*	*63*	*30*
090.	North Dakota, University of-Grand Forks	15	8	20	.36	5.5	.80	.10
	Chemistry	*42*	*40*	*41*	*62*	*55*	*54*	*34*
091.	North Texas State University-Denton	18	18	37	.05	5.5	.43	.38
	Chemistry	*45*	*42*	*44*	*33*	*55*	*18*	*54*
092.	Northeastern University	13	25	45	.19	6.1	.89	.15
	Chemistry	*40*	*44*	*45*	*46*	*47*	*63*	*37*
093.	Northern Illinois University-De Kalb	21	18	15	.16	6.7	.89	.39
	Chemistry	*48*	*42*	*40*	*43*	*39*	*63*	*54*
094.	Northwestern University	28	126	124	.37	5.2	.82	.33
	Chemistry	*55*	*67*	*58*	*62*	*60*	*56*	*50*
095.	Notre Dame, University of	16	23	42	.22	6.0	.73	.46
	Chemistry	*43*	*44*	*45*	*49*	*49*	*47*	*60*
096.	Ohio State University-Columbus	39	142	220	.11	5.4	.76	.29
	Chemistry	*66*	*71*	*74*	*39*	*57*	*51*	*47*
097.	Ohio University-Athens	16	19	47	.06	5.9	.88	.44
	Chemistry	*43*	*43*	*46*	*35*	*50*	*61*	*58*
098.	Oklahoma State University-Stillwater	17	33	47	.36	6.2	.70	.21
	Chemistry	*44*	*46*	*46*	*62*	*46*	*44*	*42*
099.	Oklahoma, University of-Norman	26	27	28	.23	6.3	.81	.36
	Chemistry	*53*	*45*	*42*	*50*	*45*	*55*	*52*
100.	Oregon State University-Corvallis	25	44	75	.32	5.6	.83	.36
	Chemistry	*52*	*48*	*50*	*58*	*55*	*57*	*52*

* indicates program was initiated since 1970.

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TABLE 3.1 Program Measures (Raw and Standardized Values) in Chemistry

Prog No.	Survey Results				University Library	Research Support		Published Articles		Survey Ratings Standard Error			
	(08)	(09)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(08)	(09)	(10)	(11)
081.	1.4	1.0	1.2	0.4	NA	.24	947	45		.10	.11	.13	.06
	39	*38*	*56*	*38*		*39*	*43*	*45*	*44*				
082.	2.8	1.9	1.5	1.0	-0.5	.52	1745	72		.09	.06	.07	.08
	53	*54*	*71*	*53*	*44*	*52*	*50*	*49*	*49*				
083.	1.7	1.2	0.9	0.5	NA	.47	NA	22		.10	.09	.06	.06
	42	*42*	*41*	*41*		*49*		*41*	*41*				
084.	1.7	1.4	1.1	0.4	-1.0	.29	NA	29		.09	.09	.10	.06
	42	*45*	*52*	*40*	*39*	*41*		*42*	*42*				
085.	2.1	1.4	0.9	0.8	NA	.26	NA	43		.09	.08	.08	.07
	46	*45*	*41*	*48*		*40*		*44*	*43*				
086.	2.4	1.5	0.8	0.8	0.5	.37	NA	17		.08	.09	.07	.06
	48	*48*	*36*	*48*	*54*	*45*		*40*	*41*				
087.	2.1	1.5	1.2	0.7	NA	.19	NA	85		.10	.08	.07	.06
	45	*48*	*58*	*45*		*36*		*51*	*44*				
088.	3.7	2.3	1.5	1.3	1.0	.60	1685	139		.08	.06	.06	.06
	62	*63*	*69*	*60*	*59*	*56*	*49*	*60*	*59*				
089.	1.3	0.9	0.9	0.3	NA	.00	NA	29		.11	.12	.10	.05
	37	*36*	*43*	*37*		*27*		*42*	*41*				
090.	1.4	0.8	0.9	0.4	NA	.33	NA	21		.13	.11	.11	.06
	39	*34*	*41*	*39*		*43*		*41*	*41*				
091.	1.5	0.9	1.0	0.4	NA	.33	NA	35		.12	.10	.10	.06
	40	*36*	*46*	*39*		*43*		*43*	*43*				
092.	1.6	1.3	1.1	0.6	NA	.62	NA	44		.11	.11	.08	.06
	41	*43*	*52*	*43*		*57*		*44*	*44*				
093.	1.4	1.0	1.0	0.4	NA	.24	NA	33		.10	.10	.09	.06
	38	*38*	*45*	*40*		*39*		*43*	*43*				
094.	4.1	2.4	1.0	1.6	0.3	.89	1851	160		.07	.05	.07	.05
	65	*64*	*45*	*67*	*52*	*70*	*51*	*63*	*64*				
095.	2.7	1.6	0.9	1.1	-1.3	.50	2746	136		.09	.06	.07	.07
	51	*50*	*44*	*55*	*36*	*51*	*58*	*59*	*63*				
096.	3.9	2.3	1.1	1.5	0.9	.59	2039	231		.06	.05	.06	.06
	63	*62*	*52*	*66*	*58*	*55*	*52*	*75*	*75*				
097.	1.6	1.0	0.7	0.5	NA	.31	NA	14		.10	.09	.08	.06
	40	*39*	*35*	*41*		*42*		*39*	*41*				
098.	1.9	1.4	1.2	0.6	-1.9	.53	NA	35		.10	.10	.08	.06
	44	*45*	*57*	*44*	*30*	*52*		*43*	*43*				
099.	2.3	1.5	1.2	0.6	-0.6	.46	869	62		.10	.08	.07	.06
	47	*48*	*55*	*44*	*44*	*49*	*42*	*47*	*45*				
100.	2.8	1.9	1.1	0.9	NA	.56	1065	61		.09	.06	.07	.07
	52	*54*	*52*	*51*		*54*	*44*	*47*	*47*				

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TABLE 3.1 Program Measures (Raw and Standardized Values) in Chemistry

Prog No.	University - Department/Academic Unit	Program Size			Characteristics of Program Graduates			
		(01)	(02)	(03)	(04)	(05)	(06)	(07)
101.	Oregon, University of-Eugene	23	59	64	.34	5.4	.71	.41
	Chemistry	*50*	*52*	*48*	*60*	*57*	*45*	*56*
102.	Pennsylvania State University	25	99	174	.26	5.8	.71	.24
	Chemistry	*52*	*61*	*66*	*53*	*51*	*45*	*43*
103.	Pennsylvania, University of	25	69	137	.33	6.0	.73	.35
	Chemistry	*52*	*54*	*60*	*59*	*49*	*47*	*51*
104.	Pittsburgh, University of	23	83	136	.24	5.1	.76	.42
	Chemistry	*50*	*57*	*60*	*50*	*61*	*51*	*56*
105.	Polytech Institute of New York	18	34	36	.47	7.3	.52	.23
	Chemistry	*45*	*46*	*44*	*71*	*32*	*27*	*43*
106.	Princeton University	17	77	80	.37	5.4	.80	.36
	Chemistry	*44*	*56*	*51*	*62*	*57*	*54*	*52*
107.	Purdue University-West Lafayette	47	170	218	.17	5.6	.88	.27
	Chemistry	*75*	*78*	*73*	*44*	*55*	*62*	*46*
108.	Rensselaer Polytechnic Institute	30	39	74	.29	6.3	.71	.25
	Chemistry	*57*	*47*	*50*	*55*	*45*	*45*	*44*
109.	Rhode Island, University of	15	21	17	.25	6.6	.70	.40
	Chemistry	*42*	*43*	*41*	*52*	*41*	*44*	*55*
110.	Rice University	19	46	48	.20	4.5	.65	.21
	Chemistry	*46*	*49*	*46*	*48*	*68*	*39*	*41*
111.	Rochester, University of	22	47	85	.15	5.4	.78	.33
	Chemistry	*49*	*49*	*52*	*43*	*57*	*52*	*50*
112.	Rutgers, The State University-New Brunswick	42	48	191	.23	6.7	.75	.31
	Chemistry	*70*	*49*	*69*	*50*	*39*	*49*	*49*
113.	Rutgers, The State University-Newark	14	31	101	.21	8.5	.66	.21
	Chemistry	*41*	*45*	*54*	*48*	*15*	*40*	*41*
114.	SUNY at Binghamton	16	20	36	.10	7.3	.63	.21
	Chemistry	*43*	*43*	*44*	*38*	*31*	*38*	*42*
115.	SUNY at Buffalo	25	73	87	.18	6.5	.83	.32
	Chemistry	*52*	*55*	*52*	*46*	*43*	*57*	*50*
116.	SUNY at Stony Brook	32	40	56	.15	6.3	.69	.41
	Chemistry	*59*	*48*	*47*	*43*	*45*	*44*	*56*
117.	SUNY-College of Environ Science & Forestry	14	21	17	.25	7.3	.69	.13
	Chemistry	*41*	*43*	*41*	*52*	*31*	*43*	*35*
118.	South Carolina, University of-Columbia	25	55	109	.13	4.6	.75	.46
	Chemistry	*52*	*51*	*56*	*41*	*67*	*49*	*59*
119.	South Florida, University of-Tampa	17	19	20	.06	5.5	.77	.59
	Chemistry	*44*	*43*	*41*	*34*	*55*	*51*	*69*
120.	Southern California, University of	26	48	84	.17	5.2	.89	.59
	Chemistry	*53*	*49*	*52*	*44*	*60*	*63*	*69*

* indicates program was initiated since 1970.

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TABLE 3.1 Program Measures (Raw and Standardized Values) in Chemistry

Prog No.	Survey Results				University Library	Research Support		Published Articles		Survey Ratings Standard Error			
	(08)	(09)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(08)	(09)	(10)	(11)
101.	3.4	2.0	1.2	1.0	-0.9	.74	1074	46		.08	.06	.06	.07
	58	*57*	*58*	*53*	*40*	*62*	*44*	*45*	*48*				
102.	3.5	2.1	1.2	1.4	0.7	.80	2303	169		.07	.05	.07	.06
	60	*60*	*54*	*64*	*56*	*65*	*54*	*65*	*59*				
103.	3.4	2.1	1.2	1.2	0.7	.76	2211	105		.07	.05	.06	.06
	59	*59*	*55*	*59*	*56*	*63*	*54*	*54*	*54*				
104.	3.2	2.0	0.9	1.2	0.1	.65	1728	157		.07	.05	.09	.07
	57	*57*	*41*	*58*	*50*	*58*	*49*	*63*	*62*				
105.	2.0	1.5	0.7	0.5	NA	.67	720	50		.10	.10	.10	.06
	44	*48*	*35*	*40*		*59*	*41*	*45*	*43*				
106.	4.0	2.4	0.8	1.6	0.9	.77	2242	133		.07	.05	.06	.05
	64	*64*	*39*	*67*	*58*	*64*	*54*	*59*	*60*				
107.	3.9	2.3	1.2	1.6	-0.5	.47	3438	292		.08	.06	.06	.05
	64	*62*	*56*	*69*	*44*	*50*	*64*	*85*	*79*				
108.	2.5	1.8	1.1	0.7	NA	.40	968	77		.08	.07	.07	.06
	50	*53*	*52*	*45*		*46*	*43*	*50*	*45*				
109.	1.7	1.2	1.0	0.4	NA	.27	NA	33		.12	.09	.09	.05
	41	*42*	*47*	*38*		*40*		*43*	*41*				
110.	3.3	2.1	1.1	1.1	-1.4	.63	1227	64		.07	.05	.08	.06
	58	*59*	*52*	*57*	*35*	*57*	*45*	*48*	*50*				
111.	3.5	2.2	1.5	1.1	-0.6	.68	2536	50		.08	.05	.08	.07
	59	*60*	*68*	*56*	*43*	*60*	*56*	*45*	*48*				
112.	2.7	1.8	1.1	0.9	0.8	.31	991	109		.08	.05	.07	.06
	52	*53*	*50*	*51*	*57*	*42*	*43*	*55*	*55*				
113.	1.7	1.2	0.9	0.5	NA	.21	991	13		.12	.09	.09	.06
	41	*42*	*43*	*42*		*37*	*43*	*39*	*41*				
114.	2.0	1.3	1.0	0.7	NA	.44	NA	38		.09	.08	.10	.06
	44	*45*	*47*	*47*		*48*		*43*	*43*				
115.	3.0	1.9	1.1	1.1	0.3	.64	1143	173		.08	.05	.08	.06
	55	*55*	*50*	*56*	*52*	*58*	*45*	*66*	*59*				
116.	3.1	1.9	1.0	1.1	-0.6	.50	1801	91		.08	.05	.06	.05
	56	*54*	*49*	*57*	*43*	*51*	*50*	*52*	*54*				
117.	2.0	1.2	0.6	0.4	NA	.57	1404	44		.15	.13	.11	.06
	44	*42*	*30*	*38*		*54*	*47*	*44*	*44*				
118.	2.7	1.8	1.6	0.8	-0.4	.68	933	81		.08	.06	.07	.07
	52	*54*	*73*	*49*	*46*	*60*	*43*	*50*	*49*				
119.	1.3	0.8	0.9	0.5	NA	.29	NA	30		.10	.10	.10	.06
	37	*35*	*45*	*41*		*41*		*42*	*42*				
120.	3.4	2.0	1.6	1.2	0.4	.81	2181	144		.07	.05	.06	.06
	59	*56*	*73*	*59*	*53*	*66*	*53*	*61*	*62*				

NOTE: On the first line of data for every program, raw values for each measure are reported; on the second line values are reported in standardized form, with mean = 50 and standard deviation = 10. "NA" indicates that the value for a measure is not available. Since the scale used to compute measure (16) is entirely arbitrary, only values in standardized form are reported for this measure.

TABLE 3.1 Program Measures (Raw and Standardized Values) in Chemistry

Prog No.	University - Department/Academic Unit	Program Size			Characteristics of Program Graduates			
		(01)	(02)	(03)	(04)	(05)	(06)	(07)
121.	Southern Illinois University-Carbondale	16	23	22	.08	6.1	.88	.63
	Chemistry and Biochemistry	*43*	*44*	*41*	*36*	*47*	*61*	*71*
122.	Southern Mississippi, Univ of-Hattiesburg	14	17	14	.36	5.3	.86	.50
	Chemistry	*41*	*42*	*40*	*61*	*59*	*60*	*62*
123.	Stanford University	18	108	109	.27	5.1	.88	.43
	Chemistry	*45*	*63*	*56*	*54*	*60*	*61*	*57*
124.	Syracuse University	18	23	36	.28	6.8	.67	.17
	Chemistry	*45*	*44*	*44*	*54*	*39*	*41*	*38*
125.	Temple University	18	17	35	.30	7.3	.68	.26
	Chemistry	*45*	*42*	*44*	*56*	*32*	*42*	*45*
126.	Tennessee, University of-Knoxville	28	43	50	.20	5.9	.96	.20
	Chemistry	*55*	*48*	*46*	*47*	*50*	*69*	*41*
127.	Texas A & M University	46	107	149	.33	5.4	.66	.31
	Chemistry	*74*	*63*	*62*	*59*	*57*	*41*	*49*
128.	Texas Tech University-Lubbock	13	28	59	.24	6.3	.76	.62
	Chemistry	*40*	*45*	*47*	*51*	*44*	*50*	*71*
129.	Texas, University of-Austin	36	89	230	.30	5.8	.66	.29
	Chemistry	*63*	*59*	*75*	*56*	*51*	*41*	*47*
130.	Tulane University	12	11	11	.25	5.8	.67	.25
	Chemistry	*39*	*41*	*40*	*52*	*51*	*41*	*44*
131.	Utah State University-Logan	16	22	21	.32	7.3	.68	.26
	Chemistry and Biochemistry	*43*	*43*	*41*	*58*	*31*	*43*	*45*
132.	Utah, University of-Salt Lake City	27	57	90	.27	5.8	.75	.39
	Chemistry	*54*	*51*	*53*	*53*	*52*	*49*	*54*
133.	Vanderbilt University	19	31	37	.37	5.0	.71	.37
	Chemistry	*46*	*45*	*44*	*63*	*62*	*46*	*53*
134.	Vermont, University of	13	24	26	.36	5.4	.95	.67
	Chemistry	*40*	*44*	*42*	*62*	*57*	*69*	*74*
135.	Virginia Polytechnic Institute & State Univ	30	55	93	.22	5.9	.65	.15
	Chemistry	*57*	*51*	*53*	*49*	*50*	*40*	*37*
136.	Virginia, University of	26	36	73	.39	5.2	.71	.43
	Chemistry	*53*	*47*	*50*	*64*	*60*	*46*	*57*
137.	Washington State University-Pullman	29	17	40	.15	5.8	.78	.33
	Chemistry	*56*	*42*	*44*	*43*	*52*	*52*	*50*
138.	Washington University-Saint Louis	19	35	52	.38	6.1	.83	.58
	Chemistry	*46*	*46*	*46*	*63*	*48*	*56*	*68*
139.	Washington, University of-Seattle	34	74	56	.28	6.2	.66	.30
	Chemistry	*61*	*55*	*47*	*54*	*46*	*41*	*48*
140.	Wayne State University	30	64	52	.16	6.5	.74	.26
	Chemistry	*57*	*53*	*46*	*43*	*43*	*48*	*45*

# indicates program was initiated since 1970.

NOTE: On the first line of data for every program, raw values for each measure are reported; on the second line values are reported in standardized form, with mean = 50 and standard deviation = 10. "NA" indicates that the value for a measure is not available.

TABLE 3.1 Program Measures (Raw and Standardized Values) in Chemistry

Prog No.	Survey Results				University Library	Research Support		Published Articles		Survey Ratings Standard Error			
	(08)	(09)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(08)	(09)	(10)	(11)
121.	1.7	1.1	0.7	0.6	-0.2	.13	NA	30		.10	.09	.07	.06
	41	*40*	*33*	*44*	*47*	*33*		*42*	*43*				
122.	0.8	0.6	1.0	0.2	NA	.29	NA	23		.08	.10	.13	.05
	32	*30*	*47*	*35*		*41*		*41*	*41*				
123.	4.5	2.6	0.7	1.6	2.0	.83	4159	177		.06	.05	.07	.05
	70	*68*	*35*	*69*	*70*	*67*	*70*	*66*	*65*				
124.	2.3	1.6	1.0	0.9	-0.3	.44	691	40		.07	.08	.07	.06
	48	*49*	*46*	*50*	*46*	*48*	*41*	*44*	*44*				
125.	1.7	1.1	1.0	0.5	-0.4	.22	NA	27		.11	.09	.07	.06
	41	*40*	*47*	*41*	*45*	*38*		*42*	*43*				
126.	2.2	1.6	1.1	0.5	-0.4	.32	929	76		.10	.09	.09	.06
	47	*49*	*52*	*41*	*45*	*43*	*43*	*50*	*45*				
127.	3.7	2.0	1.4	1.3	-0.5	.50	3715	246		.07	.04	.07	.06
	61	*58*	*67*	*61*	*45*	*51*	*66*	*78*	*74*				
128.	2.2	1.4	1.3	0.8	NA	.54	736	38		.10	.08	.08	.07
	46	*46*	*59*	*49*		*53*	*41*	*43*	*44*				
129.	3.8	2.2	1.4	1.3	1.6	.58	3373	261		.07	.05	.06	.06
	63	*61*	*64*	*61*	*66*	*55*	*63*	*80*	*80*				
130.	1.6	1.1	0.7	0.7	-1.0	.50	NA	1		.08	.08	.09	.07
	40	*40*	*35*	*46*	*39*	*51*		*37*	*39*				
131.	1.6	1.1	1.1	0.3	NA	.44	NA	22		.13	.12	.09	.05
	40	*41*	*52*	*37*		*48*		*41*	*41*				
132.	3.7	2.1	1.6	1.4	-0.6	.74	2290	140		.07	.05	.06	.06
	62	*59*	*73*	*63*	*43*	*62*	*54*	*60*	*63*				
133.	2.6	1.6	1.0	0.8	-0.7	.42	NA	72		.09	.08	.06	.07
	50	*50*	*49*	*48*	*42*	*47*		*49*	*46*				
134.	2.2	1.4	1.1	0.7	NA	.54	NA	38		.09	.09	.08	.07
	46	*46*	*51*	*45*		*53*		*43*	*44*				
135.	2.4	1.7	1.2	0.8	-0.0	.30	1281	73		.11	.07	.08	.07
	48	*51*	*57*	*48*	*49*	*42*	*46*	*49*	*48*				
136.	2.8	1.8	1.4	0.9	0.7	.46	813	98		.08	.06	.08	.06
	52	*53*	*67*	*51*	*57*	*49*	*42*	*53*	*57*				
137.	2.5	1.8	1.2	0.7	-0.3	.69	785	61		.09	.08	.06	.06
	50	*54*	*57*	*46*	*46*	*60*	*42*	*47*	*45*				
138.	2.7	1.8	1.1	0.8	-0.4	.47	741	28		.08	.06	.08	.07
	52	*52*	*52*	*48*	*45*	*50*	*41*	*42*	*43*				
139.	3.5	2.0	1.0	1.2	1.5	.44	921	98		.07	.06	.06	.05
	59	*57*	*49*	*58*	*64*	*48*	*43*	*53*	*55*				
140.	3.0	1.9	1.0	1.1	-0.4	.70	2022	79		.08	.05	.08	.07
	54	*54*	*45*	*56*	*46*	*61*	*52*	*50*	*52*				

NOTE: On the first line of data for every program, raw values for each measure are reported; on the second line values are reported in standardized form, with mean = 50 and standard deviation = 10. "NA" indicates that the value for a measure is not available. Since the scale used to compute measure (16) is entirely arbitrary, only values in standardized form are reported for this measure.

TABLE 3.1 Program Measures (Raw and Standardized Values) in Chemistry

Prog No.	University - Department/Academic Unit	Program Size			Characteristics of Program Graduates			
		(01)	(02)	(03)	(04)	(05)	(06)	(07)
141.	Western Michigan University	17	7	12	NA	NA	NA	NA
	Chemistry	*44*	*40*	*40*				
142.	Wisconsin, University of-Madison	39	200	226	.15	5.6	.90	.40
	Chemistry	*66*	*85*	*75*	*43*	*54*	*64*	*55*
143.	Wisconsin, University of-Milwaukee	17	19	35	.05	6.0	.62	.24
	*Chemistry**	*44*	*43*	*44*	*34*	*49*	*37*	*43*
144.	Wyoming, University of	16	18	21	.26	5.5	.58	.26
	Chemistry	*43*	*42*	*41*	*53*	*55*	*33*	*45*
145.	Yale University	24	72	118	.25	4.9	.83	.56
	Chemistry	*51*	*55*	*57*	*52*	*64*	*57*	*66*

* indicates program was initiated since 1970.

NOTE: On the first line of data for every program, raw values for each measure are reported; on the second line values are reported in standardized form, with mean = 50 and standard deviation = 10. "NA" indicates that the value for a measure is not available.

TABLE 3.1 Program Measures (Raw and Standardized Values) in Chemistry

Prog	Survey Results				University Library	Research Support		Published Articles		Survey Ratings Standard Error			
No.	(08)	(09)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(08)	(09)	(10)	(11)
141.	0.9	0.6	0.8	0.4	NA	.00	NA	5		.10	.09	.07	.06
	34	*31*	*38*	*39*		*27*		*38*	*40*				
142.	4.4	2.6	1.0	1.7	1.6	.77	5450	253		.06	.05	.06	.05
	69	*67*	*49*	*70*	*65*	*64*	*81*	*79*	*81*				
143.	1.9	1.4	1.3	0.6	NA	.53	669	NA		.11	.09	.07	.06
	43	*45*	*61*	*44*		*52*	*41*		*NA*				
144.	1.4	0.8	0.9	0.6	NA	.31	NA	17		.11	.09	.10	.06
	38	*35*	*42*	*43*		*42*		*40*	*41*				
145.	3.9	2.4	1.1	1.4	2.1	.79	2107	98		.06	.05	.08	.06
	64	*64*	*52*	*64*	*70*	*65*	*53*	*53*	*57*				

NOTE: On the first line of data for every program, raw values for each measure are reported; on the second line values are reported in standardized form, with mean = 50 and standard deviation = 10. "NA" indicates that the value for a measure is not available. Since the scale used to compute measure (16) is entirely arbitrary, only values in standardized form are reported for this measure.

TABLE 3.2 Summary Statistics Describing Each Program Measure--Chemistry

Measure	Number of Programs Evaluated	Mean	Standard Deviation	DECILES								
				1	2	3	4	5	6	7	8	9
Program Size												
01 Raw Value	145	23	10	13	16	17	18	21	23	26	29	36
Std Value	145	50	10	40	43	44	45	48	50	53	56	63
02 Raw Value	144	51	43	14	18	23	28	36	46	59	73	108
Std Value	144	50	10	42	42	44	45	47	49	52	55	63
03 Raw Value	144	75	62	17	23	35	47	53	72	87	109	173
Std Value	144	50	10	41	42	44	46	47	50	52	56	66
Program Graduates												
04 Raw Value	140	.23	.11	.09	.14	.16	.20	.22	.25	.28	.33	.37
Std Value	140	50	10	37	42	44	47	49	52	55	59	63
05 Raw Value	140	5.9	.7	6.8	6.4	6.2	6.0	5.8	5.6	5.5	5.4	5.1
Std Value	140	50	10	38	43	46	49	51	54	56	57	61
06 Raw Value	139	.76	.10	.63	.67	.71	.74	.77	.80	.82	.85	.88
Std Value	139	50	10	37	41	45	48	51	54	56	59	62
07 Raw Value	139	.33	.14	.14	.21	.25	.29	.33	.37	.40	.44	.52
Std Value	139	50	10	36	41	44	47	50	53	55	58	64
Survey Results												
08 Raw Value	145	2.5	1.0	1.4	1.6	1.9	2.1	2.5	2.7	3.1	3.4	3.9
Std Value	145	50	10	38	41	44	46	50	52	56	59	64
09 Raw Value	145	1.6	.5	.9	1.1	1.3	1.5	1.6	1.8	1.9	2.0	2.3
Std Value	145	50	10	36	40	44	48	49	53	55	57	62
10 Raw Value	143	1.1	.2	.8	.9	.9	1.0	1.1	1.1	1.2	1.2	1.3
Std Value	143	50	10	38	42	42	47	52	52	57	57	61
11 Raw Value	145	.9	.4	.4	.5	.6	.7	.8	.9	1.1	1.2	1.5
Std Value	145	50	10	39	41	44	46	49	51	56	58	66
University Library												
12 Raw Value	87	.1	1.0	-1.1	-.6	-.5	-.4	-.2	.1	.4	.9	1.6
Std Value	87	50	10	38	43	44	45	47	50	53	58	65
Research Support												
13 Raw Value	141	.48	.21	.22	.29	.34	.43	.50	.54	.61	.67	.75
Std Value	141	50	10	38	41	43	48	51	53	56	59	63
14 Raw Value	95	1708	1106	728	813	952	1074	1273	1745	2099	2544	3575
Std Value	95	50	10	41	42	43	44	46	50	53	56	65
Publication Records												
15 Raw Value	143	78	61	19	29	38	48	61	74	93	120	161
Std Value	143	50	10	40	42	43	45	47	49	52	57	64
16 Std Value	143	50	10	41	42	43	44	46	48	54	57	63

NOTE: Standardized values reported in the preceding table have been computed from exact values of the mean and standard deviation and not the rounded values reported here. Since the scale used to compute measure 16 is entirely arbitrary, only data in standardized form are reported for this measure.

TABLE 3.3 Intercorrelations Among Program Measures on 145 Programs in Chemistry

	Measure															
	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16
Program Size																
01		.68	.75	-.11	.24	.11	.14	.64	.62	.35	.63	.39	.31	.43	.68	.65
02			.92	.02	.38	.23	.13	.83	.81	.23	.83	.61	.57	.72	.83	.86
03				.01	.32	.24	.15	.81	.79	.35	.80	.61	.51	.66	.81	.84
Program Graduates																
04					.00	-.07	.05	.11	.08	.01	.07	.10	.20	.18	-.03	.03
05						.17	.26	.47	.46	.23	.46	.19	.39	.35	.38	.41
06							.32	.28	.30	.10	.25	.28	.20	.31	.21	.22
07								.30	.27	.16	.32	.20	.23	.20	.15	.23
Survey Results																
08									.98	.35	.96	.66	.77	.79	.80	.86
09										.36	.92	.65	.77	.74	.78	.82
10											.31	.03	.32	.14	.33	.33
11												.62	.74	.77	.81	.88
University Library																
12													.37	.45	.46	.56
Research Support																
13														.55	.52	.60
14															.70	.78
Publication Records																
15																.95
16																

NOTE: Since in computing correlation coefficients program data must be available for both of the measures being correlated, the actual number of programs on which each coefficient is based varies.

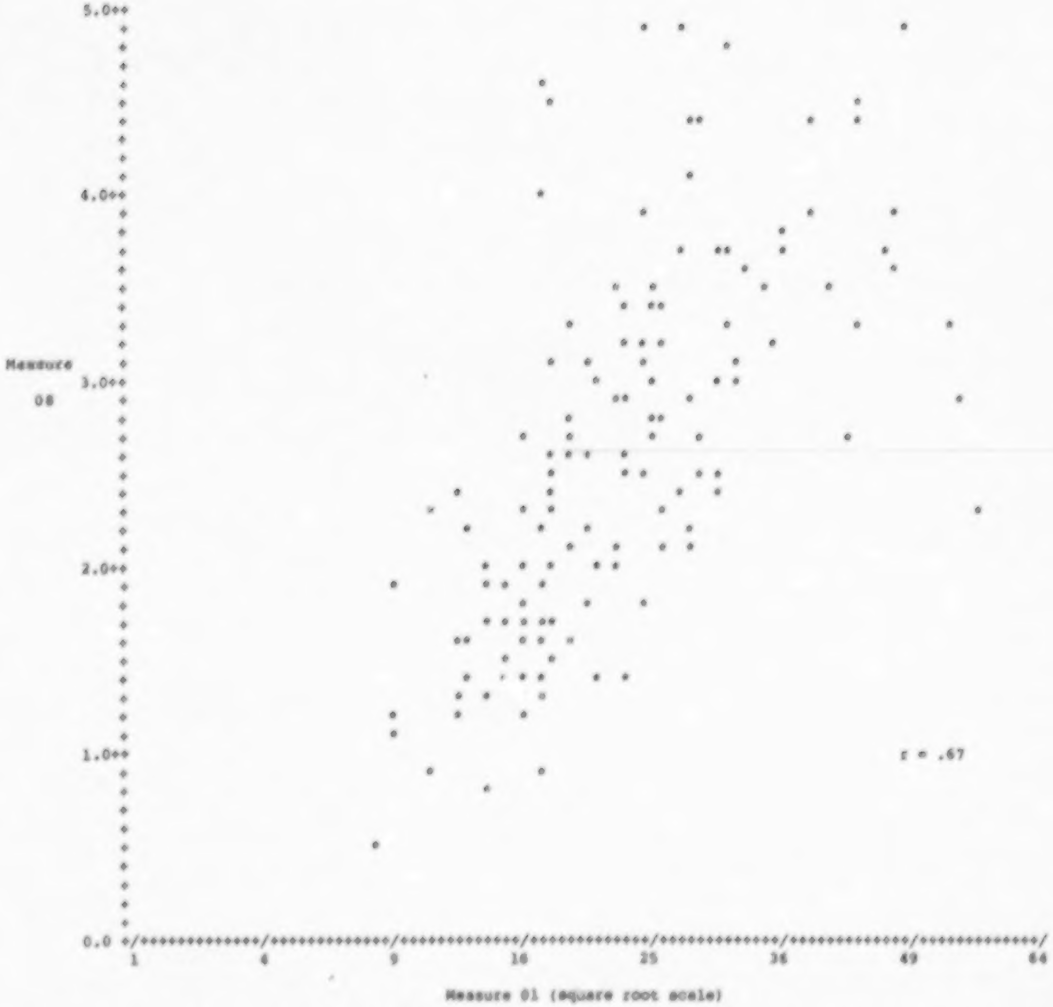

FIGURE 3.1 Mean rating of scholarly quality of faculty (measure 08) versus number of faculty members (measure 01)--145 programs in chemistry.

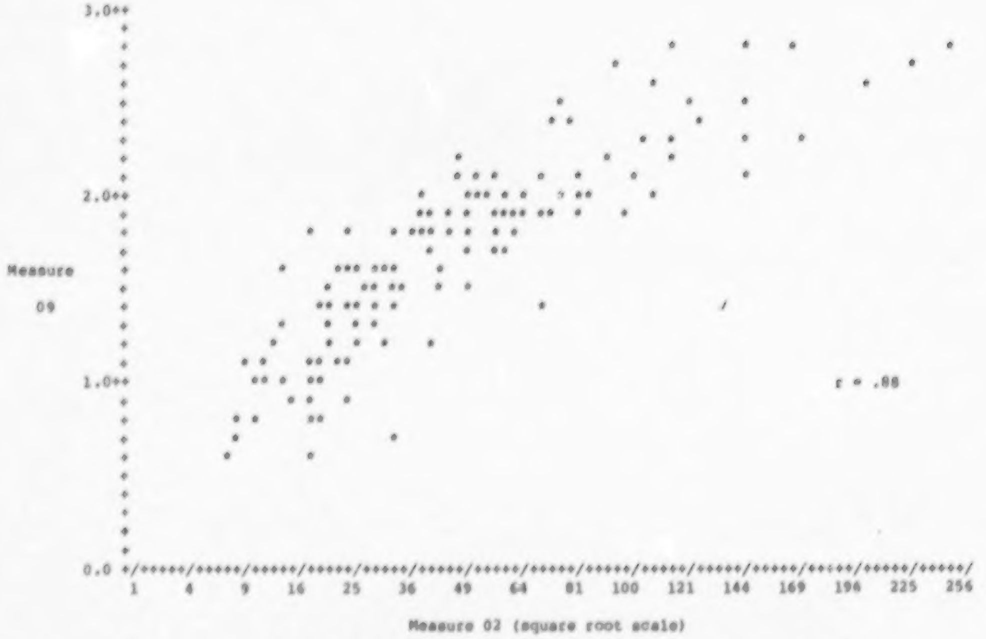

FIGURE 3.2 Mean rating of program effectiveness in educating research scholars/scientists (measure 09) versus number of graduates in last five years (measure 02)--144 programs in chemistry.

TABLE 3.4 Characteristics of Survey Participants in Chemistry

	Respondents	
	N	%
Field of Specialization		
Analytical Chemistry	39	13
Biochemistry	10	3
Inorganic Chemistry	46	15
Organic Chemistry	101	34
Physical Chemistry	67	22
Theoretical Chemistry	18	6
Other/Unknown	20	7
Faculty Rank		
Professor	188	63
Associate Professor	77	26
Assistant Professor	35	12
Other/Unknown	1	0
Year of Highest Degree		
Pre-1950	31	10
1950-59	70	23
1960-69	121	40
Post-1969	73	24
Unknown	6	2
Evaluator Selection		
Nominated by Institution	266	88
Other	35	12
Survey Form		
With Faculty Names	271	90
Without Names	30	10
Total Evaluators	301	100

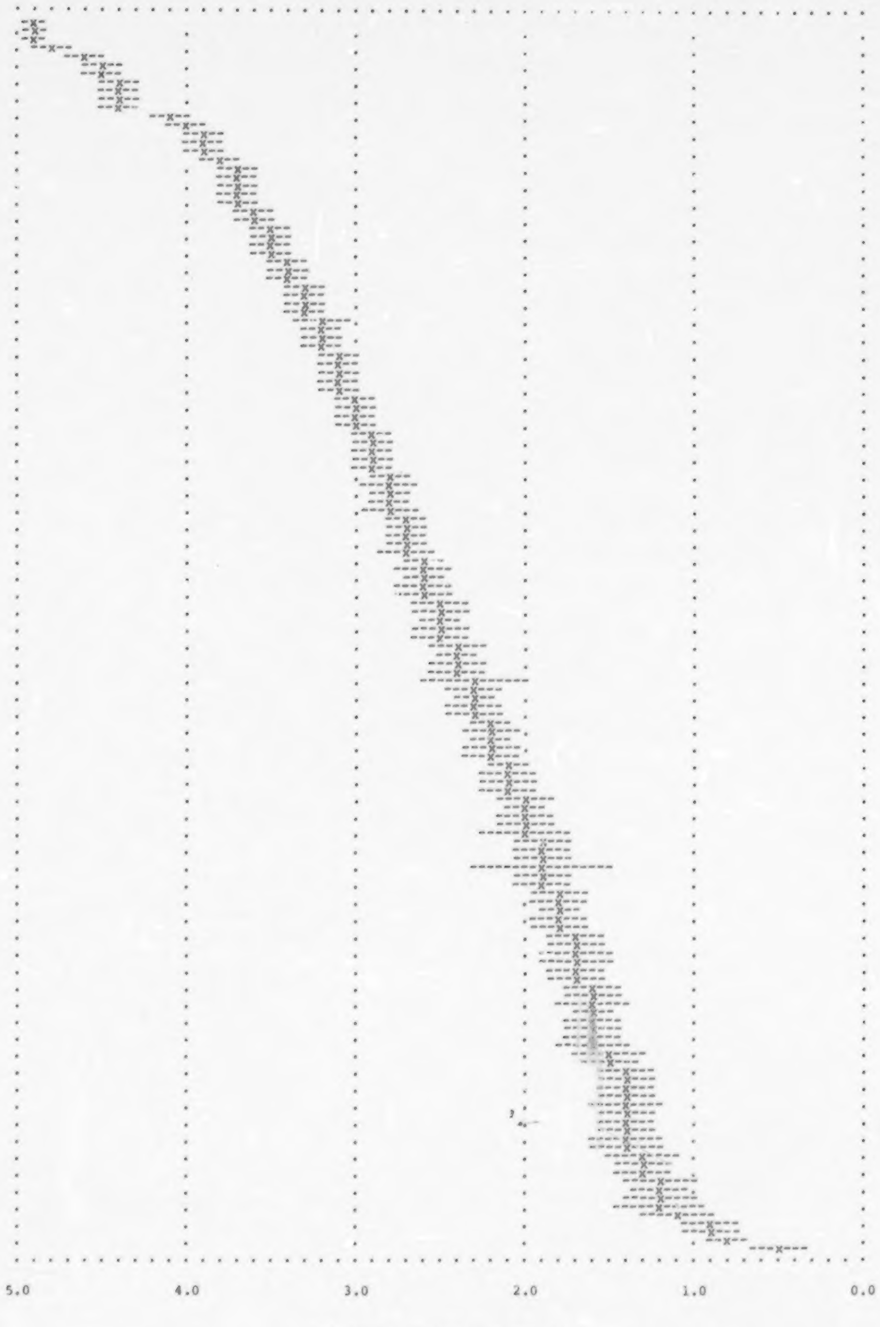

FIGURE 3.3 Mean rating of scholarly quality of faculty in 145 programs in chemistry.

NOTE: Programs are listed in sequence of mean rating, with the highest-rated program appearing at the top of the page. The broken lines (---) indicate a confidence interval of ±1.5 standard errors around the reported mean (x) of each program.

IV

Computer Science Programs

In this chapter 58 research-doctorate programs in computer sciences are assessed. These programs, according to the information supplied by their universities, have accounted for 1,154 doctoral degrees awarded during the FY1976-80 period--approximately 86 percent of the aggregate number of computer science and computer engineering doctorates earned from U.S. universities in this five-year span.[1] Because computer sciences is a younger discipline than the other five mathematical and physical sciences covered in this assessment and because computer science programs may be found in a variety of settings within universities, the committee encountered some difficulty in identifying research-doctorate programs that have produced graduates in this discipline. On the average, 41 full-time and part-time students intending to earn doctorates were enrolled in a program in December 1980, with an average faculty size of 16 members.[2] Most of the 58 programs, listed in Table 4.1, are located in computer science or computer and information science departments. Approximately 20 percent are found in departments of electrical engineering. Fifteen programs were initiated since 1970, and no two programs are located in the same university. In addition to the 58 institutions represented in this discipline, another 7 were initially identified as meeting the criteria[3] for inclusion in the assessment:

University of Chicago
George Washington University
Harvard University
Northeastern University

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[1] Data from the NRC's Survey of Earned Doctorates indicate that 889 research doctorates in computer sciences and another 458 research doctorates in computer engineering were awarded by U.S. universities between FY1976 and FY1980.

[2] See the reported means for measures 03 and 01 in Table 4.2.

[3] As mentioned in Chapter I, the primary criterion for inclusion was that a university had awarded at least 5 doctorates in computer sciences during the FY1976-78 period.

Purdue University
University of Southwest Louisiana
University of Texas, Health Science
  Center--Dallas

The latter two institutions chose not to participate in the assessment in any discipline. Computer science programs at the other five institutions have not been included in the evaluations in this discipline, since in each case the study coordinator either indicated that the institution did not at that time have a research-doctorate program in computer sciences or failed to provide the information requested by the committee.

Before examining individual program results presented in Table 4.1, the reader is urged to refer to Chapter II, in which each of the 16 measures used in the assessment is discussed. Summary statistics describing every measure are given in Table 4.2. For nine of the measures, data are reported for at least 56 of the 58 computer science programs. For measures 04-07, which pertain to characteristics of the program graduates, data are presented for only approximately half of the programs; the other half had too few graduates on which to base statistics.[*] For measure 12, a composite index of the size of a university library, data are available for 49 programs; for measure 14, total university expenditures for research in this discipline, data are available for 44 programs. The programs not evaluated on measures 12 and 14 are typically smaller--in terms of faculty size and graduate student enrollment--than other computer science programs. Were data on these two measures available for all 58 programs, it is likely that their reported means would be appreciably lower (and that some of the correlations of these measures with others would be higher). With respect to measure 13, the fraction of faculty with research support from the National Science Foundation, the National Institutes of Health, and the Alcohol, Drug Abuse, and Mental Health Administration, data are reported for 45 programs that had at least 10 faculty members.

Intercorrelations among the 16 measures (Pearson product-moment coefficients) are given in Table 4.3. Of particular note are the high positive correlations of the measures of program size (01-03) with measures of publication records (15, 16) and reputational survey ratings (08 and 09). Figure 4.1 illustrates the relation between the mean rating of the scholarly quality of faculty (measure 08) and the number of faculty members (measure 01) for each of 57 programs in computer sciences. Figure 4.2 plots the mean rating of program effectiveness (measure 09) against the total number of FY1976-80 program graduates (measure 02). Although in both figures there is a significant positive correlation between program size and reputational rating, it is quite apparent that some of the smaller programs received high mean ratings and that some of the larger programs received low mean ratings.

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[*] As mentioned in Chapter II, data for measures 04-07 are not reported if they are based on the survey responses of fewer than 10 FY1975-79 program graduates.

Table 4.4 describes the 108 faculty members who participated in the evaluation of computer science programs. These individuals constituted 62 percent of those asked to respond to the survey in this discipline and 12 percent of the faculty population in the 58 research-doctorate programs being evaluated.[5] A majority of the survey participants had earned their highest degree since 1970, and almost one-third held the rank of assistant professor. Two exceptions should be noted with regard to the survey evaluations in this discipline. Regretably, ratings are unavailable for the program in the Department of Computer and Communications Sciences at the University of Michigan since an entirely inaccurate list of its faculty members was included on the survey form. Also, it has been called to the attention of the committee that the faculty list (used in the survey) for the Department of Computer Science at Columbia University was missing the names of four members. The committee has decided to report the survey results for this program but cautions that the reputational ratings may have been influenced by the omission of these names.

To assist the reader in interpreting results of the survey evaluations, estimated standard errors have been computed for mean ratings of the scholarly quality of faculty in 57 computer science programs (and are given in Table 4.1). For each program the mean rating and an associated "confidence interval" of 1.5 standard errors are illustrated in Figure 4.3 (listed in order of highest to lowest mean rating). In comparing two programs, if their confidence intervals do not overlap, one may conclude that there is a significant difference in their mean ratings at a .05 level of significance.[6] From this figure it is also apparent that one should have somewhat more confidence in the accuracy of the mean ratings of higher-rated programs than lower-rated programs. This generalization results primarily from the fact that evaluators are not as likely to be familiar with the less prestigious programs, and consequently the mean ratings of these programs are usually based on fewer survey responses.

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[5] See Table 2.3 in Chapter II.

[6] See pp. 29-31 for a discussion of the interpretation of mean ratings and associated confidence intervals.

TABLE 4.1 Program Measures (Raw and Standardized Values) in Computer Sciences

		Program Size			Characteristics of Program Graduates			
Prog No.	University - Department/Academic Unit	(01)	(02)	(03)	(04)	(05)	(06)	(07)
001.	Arizona, University of-Tucson	7	4	13	NA	NA	NA	NA
	Computer Sciences	*40*	*42*	*43*				
002.	Brown University	8	4	21	NA	NA	NA	NA
	*Computer Science**	*41*	*42*	*45*				
003.	California Institute of Technology	5	5	22	NA	NA	NA	NA
	*Computer Science**	*37*	*42*	*45*				
004.	California, University of-Berkeley	30	43	53	.14	6.3	.79	.24
	Electrical Engineering & Computer Sciences	*66*	*62*	*53*	*47*	*51*	*50*	*41*
005.	California, University of-Irvine	12	15	46	.09	5.3	.64	.27
	Information and Computer Science	*45*	*47*	*51*	*43*	*60*	*32*	*43*
006.	California, University of-Los Angeles	36	55	103	.00	7.9	.65	.25
	Computer Science	*73*	*68*	*65*	*35*	*37*	*34*	*42*
007.	California, University of-San Diego	9	7	17	NA	NA	NA	NA
	Electrical Engineering & Computer Science	*42*	*43*	*44*				
008.	California, University of-Santa Barbara	8	10	9	NA	NA	NA	NA
	Electrical and Computer Engineering	*41*	*45*	*42*				
009.	Carnegie-Mellon University	31	41	83	.22	6.8	.81	.50
	Computer Science	*68*	*61*	*60*	*54*	*47*	*51*	*57*
010.	Case Western Reserve University	7	9	10	NA	NA	NA	NA
	Computer Engin/Computing & Information Sci	*40*	*44*	*42*				
011.	Columbia University	11	2	17	NA	NA	NA	NA
	*Computer Science**	*44*	*41*	*44*				
012.	Connecticut, University of-Storrs	11	8	12	NA	NA	NA	NA
	Electrical Engineering & Computer Science	*44*	*44*	*43*				
013.	Cornell University-Ithaca	14	34	48	.27	5.5	.97	.63
	Computer Science	*48*	*57*	*52*	*58*	*59*	*69*	*65*
014.	Duke University	13	10	29	NA	NA	NA	NA
	*Computer Science**	*47*	*45*	*47*				
015.	Georgia Institute of Technology	11	8	30	.10	NA	.80	.10
	Information and Computer Science	*44*	*44*	*47*	*43*		*50*	*33*
016.	Illinois, University-Urbana/Champaign	30	112	125	.13	6.1	.85	.28
	Computer Science	*66*	*97*	*71*	*46*	*53*	*56*	*44*
017.	Indiana University-Bloomington	15	NA	16	NA	NA	NA	NA
	*Computer Science**	*49*		*44*				
018.	Iowa State University-Ames	15	18	17	.07	5.8	.73	.33
	Computer Science	*49*	*49*	*44*	*41*	*56*	*43*	*47*
019.	Iowa, University of-Iowa City	12	11	20	.36	5.3	.80	.70
	Computer Science	*45*	*45*	*45*	*67*	*61*	*50*	*69*
020.	Kansas State University-Manhattan	8	7	12	NA	NA	NA	NA
	*Computer Science**	*41*	*43*	*43*				

* indicates program was initiated since 1970.

NOTE: On the first line of data for every program, raw values for each measure are reported; on the second line values are reported in standardized form, with mean = 50 and standard deviation = 10. "NA" indicates that the value for a measure is not available.

TABLE 4.1 Program Measures (Raw and Standardized Values) in Computer Sciences

Prog No.	Survey Results				University Library	Research Support		Published Articles		Survey Ratings Standard Error			
	(08)	(09)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(08)	(09)	(10)	(11)
001.	2.4	1.4	1.3	1.0	0.9	NA	323	15		.11	.10	.11	.07
	48	*48*	*57*	*54*	*55*		*44*	*44*	*46*				
002.	2.9	1.7	1.5	1.2	-1.1	NA	417	25		.10	.09	.08	.06
	54	*53*	*63*	*57*	*35*		*45*	*47*	*47*				
003.	2.5	1.5	0.8	0.9	NA	NA	871	26		.17	.11	.12	.08
	50	*50*	*40*	*50*			*48*	*48*	*47*				
004.	4.5	2.6	1.3	1.6	2.2	.60	NA	134		.08	.06	.07	.05
	70	*69*	*57*	*68*	*69*	*63*		*83*	*82*				
005.	2.4	1.4	0.9	0.8	NA	.17	98	12		.09	.09	.13	.07
	49	*47*	*42*	*50*		*40*	*43*	*43*	*44*				
006.	3.8	2.2	1.3	1.3	2.0	.61	126	77		.08	.05	.08	.05
	63	*62*	*57*	*60*	*66*	*63*	*43*	*64*	*61*				
007.	2.6	1.2	1.1	0.8	-0.0	NA	376	21		.13	.12	.11	.07
	51	*45*	*49*	*49*	*45*		*45*	*46*	*48*				
008.	2.1	1.2	1.1	0.8	-0.1	NA	305	27		.11	.11	.12	.07
	46	*43*	*50*	*48*	*45*		*44*	*48*	*49*				
009.	4.8	2.7	1.1	1.8	NA	.26	3649	53		.05	.05	.07	.05
	73	*71*	*50*	*72*		*44*	*67*	*56*	*61*				
010.	1.3	0.8	0.4	0.4	-1.3	NA	NA	24		.11	.13	.10	.06
	37	*36*	*24*	*40*	*32*			*47*	*44*				
011.	2.5	1.2	1.6	0.8	1.7	.36	NA	23		.12	.11	.08	.07
	50	*45*	*67*	*49*	*64*	*50*		*47*	*46*				
012.	1.7	1.0	1.2	0.5	-0.5	.36	435	12		.13	.12	.09	.06
	41	*41*	*54*	*43*	*41*	*50*	*45*	*43*	*43*				
013.	4.3	2.5	1.1	1.6	1.6	.57	987	52		.07	.06	.07	.05
	68	*68*	*49*	*67*	*62*	*61*	*49*	*56*	*54*				
014.	2.4	1.5	1.3	0.7	0.3	.46	218	12		.10	.10	.10	.07
	49	*50*	*56*	*46*	*49*	*55*	*44*	*43*	*43*				
015.	2.7	1.6	1.8	0.8	NA	.27	4056	30		.10	.08	.06	.07
	52	*51*	*75*	*50*		*45*	*69*	*49*	*48*				
016.	3.8	2.3	1.0	1.4	2.0	.53	3357	155		.09	.07	.07	.06
	63	*63*	*46*	*62*	*66*	*59*	*65*	*89*	*83*				
017.	2.3	1.3	1.6	0.8	0.9	.53	67	20		.11	.12	.08	.07
	48	*46*	*66*	*49*	*55*	*59*	*43*	*46*	*46*				
018.	1.7	1.2	1.2	0.4	-0.5	.27	NA	14		.12	.13	.09	.06
	42	*45*	*51*	*40*	*40*	*45*		*44*	*43*				
019.	1.7	1.1	1.0	0.5	0.3	.25	355	10		.12	.10	.11	.07
	41	*43*	*44*	*41*	*49*	*44*	*45*	*42*	*42*				
020.	0.9	0.6	0.9	0.2	NA	NA	153	13		.13	.11	.10	.04
	33	*33*	*41*	*34*			*43*	*43*	*42*				

NOTE: On the first line of data for every program, raw values for each measure are reported; on the second line values are reported in standardized form, with mean = 50 and standard deviation = 10. "NA" indicates that the value for a measure is not available. Since the scale used to compute measure (16) is entirely arbitrary, only values in standardized form are reported for this measure.

TABLE 4.1 Program Measures (Raw and Standardized Values) in Computer Sciences

Prog		Program Size			Characteristics of Program Graduates			
No.	University - Department/Academic Unit	(01)	(02)	(03)	(04)	(05)	(06)	(07)
021.	Kansas, University of	16	6	6	NA	NA	NA	NA
	*Computer Science**	*50*	*43*	*41*				
022.	Maryland, University of-College Park	28	35	50	.08	8.0	.76	.24
	Computer Science	*64*	*58*	*52*	*42*	*37*	*46*	*41*
023.	Massachusetts Institute of Technology	34	62	135	.23	6.4	.77	.39
	Electrical Engineering and Computer Science	*71*	*71*	*73*	*55*	*51*	*47*	*50*
024.	Massachusetts, University of-Amherst	16	16	70	.00	5.4	.82	.36
	*Computer and Information Sciences**	*50*	*48*	*57*	*35*	*59*	*52*	*49*
025.	Michigan State University-East Lansing	14	8	20	NA	NA	NA	NA
	Computer Science	*48*	*44*	*45*				
026.	Michigan, University of-Ann Arbor	10	18	38	.30	6.4	.79	.63
	Computer and Communication Sciences	*43*	*49*	*49*	*61*	*50*	*49*	*65*
027.	Minnesota, University of	21	13	28	.25	6.5	.81	.50
	Computer Science	*56*	*46*	*47*	*57*	*50*	*52*	*57*
028.	Missouri, University of-Rolla	11	9	11	NA	NA	NA	NA
	*Computer Science**	*44*	*44*	*42*				
029.	New York University	13	19	63	.21	8.0	.80	.20
	Computer Science	*47*	*49*	*55*	*53*	*37*	*50*	*39*
030.	North Carolina, University of-Chapel Hill	8	17	23	.07	7.5	.88	.19
	Computer Science	*41*	*48*	*45*	*41*	*41*	*59*	*38*
031.	Northwestern University	24	41	16	.08	6.5	.92	.33
	Electrical Engineering & Computer Sciences	*59*	*61*	*44*	*41*	*50*	*63*	*47*
032.	Ohio State University-Columbus	21	43	90	.09	6.3	.76	.48
	Computer and Information Science	*56*	*62*	*62*	*43*	*51*	*46*	*56*
033.	Oklahoma, University of-Norman	15	1	26	NA	NA	NA	NA
	Electrical Engineering and Computer Sci	*49*	*40*	*46*				
034.	Pennsylvania State University	16	10	32	.15	6.3	.77	.39
	Computer Sciences	*50*	*45*	*48*	*48*	*52*	*47*	*50*
035.	Pennsylvania, University of	29	25	54	.14	6.4	.79	.41
	Computer and Information Science	*65*	*52*	*53*	*47*	*51*	*50*	*52*
036.	Pittsburgh, University of	12	10	20	NA	NA	NA	NA
	*Computer Science**	*45*	*45*	*45*				
037.	Polytech Institute of New York	8	6	33	NA	NA	NA	NA
	Electrical Engineering and Computer Science	*41*	*43*	*48*				
038.	Princeton University	9	21	26	.23	4.3	1.00	.60
	Electrical Engineering and Computer Science	*42*	*50*	*46*	*55*	*69*	*72*	*63*
039.	Rice University	22	19	23	.29	4.9	.52	.14
	Mathematical Sciences	*57*	*49*	*45*	*60*	*63*	*20*	*35*
040.	Rochester, University of	11	5	36	NA	NA	NA	NA
	*Computer Science**	*44*	*42*	*49*				

* indicates program was initiated since 1970.

NOTE: On the first line of data for every program, raw values for each measure are reported; on the second line values are reported in standardized form, with mean = 50 and standard deviation = 10. "NA" indicates that the value for a measure is not available.

TABLE 4.1 Program Measures (Raw and Standardized Values) in Computer Sciences

Prog	Survey Results				University Library	Research Support		Published Articles		Survey Ratings Standard Error			
No.	(08)	(09)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(08)	(09)	(10)	(11)
021.	1.9	1.1	0.8	0.7	0.1	.06	51	29		.10	.09	.09	.07
	44	*43*	*38*	*47*	*47*	*34*	*43*	*48*	*48*				
022.	3.1	1.9	1.2	1.3	0.2	.21	3942	58		.08	.06	.07	.06
	56	*58*	*54*	*61*	*47*	*42*	*68*	*58*	*57*				
023.	4.9	2.8	1.1	1.8	-0.3	.32	6646	108		.03	.05	.05	.04
	74	*73*	*50*	*72*	*42*	*48*	*86*	*74*	*79*				
024.	2.8	1.7	1.3	1.0	-0.7	.56	790	21		.09	.09	.09	.07
	53	*52*	*55*	*53*	*38*	*61*	*47*	*46*	*45*				
025.	1.5	0.9	0.9	0.3	0.3	.36	295	12		.13	.12	.08	.05
	39	*39*	*42*	*36*	*49*	*50*	*44*	*43*	*43*				
026.	NA	NA	NA	NA	1.8	.60	1710	41		NA	NA	NA	NA
					64	*63*	*54*	*52*	*53*				
027.	2.7	1.6	1.2	0.8	1.2	.38	126	56		.11	.08	.09	.07
	52	*52*	*52*	*49*	*58*	*51*	*43*	*57*	*60*				
028.	1.2	0.8	1.1	0.3	NA	.18	60	13		.14	.11	.09	.05
	37	*37*	*50*	*37*		*40*	*43*	*43*	*43*				
029.	2.8	1.7	1.0	0.9	0.5	.39	1192	9		.11	.07	.06	.07
	53	*53*	*45*	*51*	*51*	*51*	*50*	*42*	*45*				
030.	2.7	1.7	1.1	1.0	1.0	NA	461	24		.10	.07	.08	.06
	52	*54*	*49*	*53*	*56*		*45*	*47*	*47*				
031.	2.4	1.5	1.1	0.6	0.3	.33	NA	33		.10	.10	.09	.06
	49	*50*	*50*	*45*	*49*	*48*		*50*	*53*				
032.	2.4	1.6	1.1	0.9	0.9	.19	567	62		.10	.07	.07	.07
	49	*51*	*49*	*51*	*55*	*41*	*46*	*59*	*58*				
033.	0.8	0.3	NA	0.1	-0.6	.00	NA	9		.14	.09	NA	.03
	32	*28*		*33*	*40*	*31*		*42*	*42*				
034.	2.1	1.3	0.4	0.9	0.7	.63	3707	37		.11	.09	.09	.08
	46	*46*	*24*	*51*	*53*	*64*	*67*	*51*	*52*				
035.	2.7	1.8	1.1	1.0	0.7	.24	1586	42		.12	.08	.09	.08
	52	*54*	*49*	*53*	*53*	*43*	*53*	*53*	*49*				
036.	1.9	1.2	0.9	0.7	0.1	.33	839	32		.12	.10	.09	.06
	44	*45*	*41*	*46*	*46*	*48*	*48*	*49*	*47*				
037.	1.2	0.9	0.7	0.2	NA	NA	NA	11		.16	.14	.15	.04
	37	*38*	*35*	*36*				*43*	*43*				
038.	3.0	1.9	0.7	1.1	0.9	NA	422	21		.10	.08	.10	.07
	55	*57*	*35*	*57*	*55*		*45*	*46*	*50*				
039.	2.4	1.6	1.1	0.6	-1.4	.41	NA	13		.12	.10	.11	.06
	49	*51*	*50*	*43*	*31*	*52*		*43*	*44*				
040.	2.7	1.7	1.7	1.1	-0.6	.36	365	10		.09	.09	.07	.07
	52	*54*	*70*	*55*	*39*	*50*	*45*	*42*	*44*				

NOTE: On the first line of data for every program, raw values for each measure are reported; on the second line values are reported in standardized form, with mean = 50 and standard deviation = 10. "NA" indicates that the value for a measure is not available. Since the scale used to compute measure (16) is entirely arbitrary, only values in standardized form are reported for this measure.

TABLE 4.1 Program Measures (Raw and Standardized Values) in Computer Sciences

Prog No.	University - Department/Academic Unit	Program Size (01)	Program Size (02)	Program Size (03)	Characteristics of Program Graduates (04)	Characteristics of Program Graduates (05)	Characteristics of Program Graduates (06)	Characteristics of Program Graduates (07)
041.	Rutgers, The State University-New Brunswick	29	6	243	NA	NA	NA	NA
	*Computer Science**	*65*	*43*	*99*				
042.	SUNY at Buffalo	11	8	62	NA	NA	NA	NA
	Computer Science	*44*	*44*	*55*				
043.	SUNY at Stony Brook	16	21	22	.05	5.5	.85	.65
	*Computer Science**	*50*	*50*	*45*	*39*	*58*	*56*	*66*
044.	Southern California, University of	10	18	7	NA	NA	NA	NA
	Computer Science	*43*	*49*	*42*				
045.	Southern Methodist University	10	11	25	NA	NA	NA	NA
	Computer Science and Engineering	*43*	*45*	*46*				
046.	Stanford University	21	74	95	.53	6.8	.87	.51
	Computer Science	*56*	*77*	*63*	*81*	*47*	*58*	*58*
047.	Stevens Institute of Technology	10	10	12	NA	9.0	NA	NA
	Electrical Engineering/ Computer Science	*43*	*45*	*43*		*28*		
048.	Syracuse University	44	22	68	.17	6.0	.83	.17
	Computer Sciences	*83*	*51*	*57*	*49*	*54*	*54*	*37*
049.	Texas A & M University	10	31	22	.08	9.4	.74	.23
	Industrial Engineering	*43*	*55*	*45*	*41*	*25*	*44*	*41*
050.	Texas, University of-Austin	27	22	100	.23	7.0	.77	.42
	Computer Sciences	*63*	*51*	*65*	*55*	*45*	*47*	*53*
051.	Utah, University of-Salt Lake City	13	25	32	.21	5.4	.87	.40
	*Computer Science**	*47*	*52*	*48*	*53*	*59*	*58*	*51*
052.	Vanderbilt University	9	9	19	NA	NA	NA	NA
	Computer Science	*42*	*44*	*44*				
053.	Virginia, University of	9	9	12	NA	NA	NA	NA
	*Applied Mathematics and Computer Science**	*42*	*44*	*43*				
054.	Washington State University-Pullman	12	8	15	NA	NA	NA	NA
	Computer Science	*45*	*44*	*43*				
055.	Washington University-Saint Louis	8	13	14	NA	NA	NA	NA
	Computer Science	*41*	*46*	*43*				
056.	Washington, University of-Seattle	12	14	25	.36	7.7	NA	NA
	Computer Sciences	*45*	*47*	*46*	*67*	*40*		
057.	Wisconsin, University of-Madison	25	39	77	.16	6.6	.82	.32
	Computer Sciences	*61*	*60*	*59*	*43*	*49*	*52*	*46*
058.	Yale University	16	27	45	.13	5.3	.74	.57
	Computer Science	*50*	*53*	*51*	*46*	*60*	*44*	*61*

* indicates program was initiated since 1970.

NOTE: On the first line of data for every program, raw values for each measure are reported; on the second line values are reported in standardized form, with mean = 50 and standard deviation = 10. "NA" indicates that the value for a measure is not available.

TABLE 4.1 Program Measures (Raw and Standardized Values) in Computer Sciences

Prog No.	Survey Results				University Library	Research Support		Published Articles		Survey Ratings Standard Error			
	(08)	(09)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(08)	(09)	(10)	(11)
041.	2.4	1.4	1.4	0.7	0.8	.17	1043	27		.11	.10	.09	.07
	49	*47*	*60*	*47*	*54*	*40*	*49*	*48*	*48*				
042.	2.3	1.4	0.9	0.9	0.3	.46	556	31		.11	.08	.09	.06
	48	*49*	*43*	*51*	*48*	*55*	*46*	*49*	*48*				
043.	2.7	1.8	1.2	0.9	-0.6	.56	312	14		.10	.05	.09	.07
	52	*56*	*52*	*52*	*39*	*61*	*44*	*44*	*45*				
044.	3.2	1.8	1.3	1.3	0.4	.20	NA	75		.09	.06	.09	.06
	57	*56*	*57*	*60*	*49*	*41*		*63*	*61*				
045.	1.6	1.0	0.8	0.5	NA	.20	77	16		.14	.12	.13	.06
	41	*40*	*37*	*41*		*41*	*43*	*44*	*44*				
046.	5.0	2.8	1.1	1.9	2.0	.71	5008	106		.02	.04	.06	.03
	75	*74*	*48*	*74*	*67*	*69*	*76*	*73*	*80*				
047.	1.2	0.9	1.0	0.2	NA	.00	NA	2		.16	.16	.18	.04
	36	*38*	*45*	*34*		*31*		*40*	*40*				
048.	2.4	1.4	1.1	0.6	-0.3	.25	918	38		.13	.09	.09	.06
	49	*48*	*50*	*44*	*42*	*44*	*48*	*51*	*48*				
049.	1.1	0.7	1.0	0.3	-0.5	.00	NA	32		.13	.10	.08	.05
	35	*36*	*44*	*37*	*41*	*31*		*49*	*46*				
050.	3.2	2.1	1.3	1.3	1.6	.48	1380	53		.10	.06	.09	.06
	57	*60*	*55*	*60*	*62*	*56*	*51*	*56*	*57*				
051.	2.8	1.9	1.0	1.0	-0.6	.54	606	21		.08	.06	.10	.07
	53	*57*	*45*	*54*	*39*	*59*	*46*	*46*	*46*				
052.	1.8	1.1	1.5	0.6	-0.7	NA	NA	6		.11	.12	.11	.06
	43	*42*	*64*	*44*	*38*			*41*	*41*				
053.	1.7	1.2	1.3	0.4	0.7	NA	263	23		.14	.12	.12	.05
	42	*44*	*55*	*40*	*53*		*44*	*47*	*44*				
054.	1.5	1.0	1.2	0.3	-0.3	.25	NA	9		.15	.10	.11	.06
	40	*40*	*52*	*38*	*43*	*44*		*42*	*42*				
055.	1.4	1.0	1.0	0.4	-0.4	NA	NA	10		.15	.11	.10	.06
	39	*41*	*45*	*39*	*42*			*42*	*44*				
056.	3.4	2.0	1.7	1.3	1.5	.75	473	17		.09	.07	.08	.07
	59	*59*	*69*	*59*	*61*	*71*	*45*	*45*	*44*				
057.	3.2	1.9	1.3	1.1	1.6	.56	672	55		.10	.05	.08	.07
	57	*58*	*56*	*57*	*62*	*60*	*47*	*57*	*56*				
058.	3.5	2.1	1.1	1.3	2.1	.44	1672	22		.08	.05	.09	.07
	60	*61*	*49*	*61*	*67*	*54*	*53*	*46*	*47*				

NOTE: On the first line of data for every program, raw values for each measure are reported; on the second line values are reported in standardized form, with mean = 50 and standard deviation = 10. "NA" indicates that the value for a measure is not available. Since the scale used to compute measure (16) is entirely arbitrary, only values in standardized form are reported for this measure.

TABLE 4.2 Summary Statistics Describing Each Program Measure--Computer Sciences

Measure	Number of Programs Evaluated	Mean	Standard Deviation	DECILES 1	2	3	4	5	6	7	8	9
Program Size												
01 Raw Value	58	16	9	8	9	10	11	12	15	16	23	29
Std Value	58	50	10	41	42	43	44	45	49	50	58	65
02 Raw Value	57	20	20	5	7	9	10	13	18	21	29	42
Std Value	57	50	10	42	43	44	45	46	49	50	54	61
03 Raw Value	58	41	40	12	15	18	22	25	32	46	62	91
Std Value	58	50	10	43	43	44	45	46	48	51	55	62
Program Graduates												
04 Raw Value	31	.17	.11	.05	.08	.09	.13	.15	.20	.22	.25	.30
Std Value	31	50	10	39	42	43	46	48	53	55	57	62
05 Raw Value	31	6.5	1.2	8.0	7.6	6.8	6.5	6.4	6.3	5.8	5.4	5.3
Std Value	31	50	10	37	40	47	50	51	51	56	59	60
06 Raw Value	30	.80	.09	.65	.74	.77	.79	.80	.81	.82	.85	.88
Std Value	30	50	10	33	43	47	49	50	51	52	56	59
07 Raw Value	30	.38	.16	.17	.23	.25	.32	.36	.40	.48	.51	.63
Std Value	30	50	10	37	41	42	46	49	51	56	58	66
Survey Results												
08 Raw Value	57	2.5	1.0	1.2	1.6	1.9	2.3	2.4	2.7	2.8	3.2	3.8
Std Value	57	50	10	37	41	44	48	49	52	53	57	63
09 Raw Value	57	1.5	.6	.8	1.0	1.2	1.3	1.5	1.6	1.7	1.9	2.2
Std Value	57	50	10	37	41	44	46	50	52	53	57	63
10 Raw Value	56	1.1	.3	.8	.9	1.0	1.1	1.1	1.1	1.2	1.3	1.5
Std Value	56	50	10	38	41	45	49	49	49	53	56	64
11 Raw Value	57	.9	.4	.3	.4	.6	.7	.8	.9	1.0	1.2	1.4
Std Value	57	50	10	37	40	44	47	49	51	53	58	63
University Library												
12 Raw Value	49	.4	1.0	-.7	-.6	-.3	.1	.3	.7	.9	1.5	1.8
Std Value	49	50	10	38	39	42	47	49	53	55	61	64
Research Support												
13 Raw Value	45	.36	.19	.12	.20	.25	.27	.36	.39	.47	.56	.60
Std Value	45	50	10	37	42	44	45	50	52	56	61	63
14 Raw Value	44	1171	1561	85	205	314	401	473	719	973	1603	3684
Std Value	44	50	10	43	44	44	45	45	47	49	53	67
Publication Records												
15 Raw Value	58	34	31	10	12	14	21	23	27	33	52	65
Std Value	58	50	10	42	43	44	46	47	48	50	56	60
16 Std Value	58	50	10	42	43	44	45	47	48	49	55	61

NOTE: Standardized values reported in the preceding table have been computed from exact values of the mean and standard deviation and not the rounded values reported here. Since the scale used to compute measure 16 is entirely arbitrary, only data in standardized form are reported for this measure.

TABLE 4.3 Intercorrelations Among Program Measures on 58 Programs in Computer Sciences

	Measure															
	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16
Program Size																
01		.62	.67	-.11	-.03	-.17	-.26	.54	.54	.13	.45	.28	.12	.44	.62	.61
02			.52	.05	-.07	.12	-.05	.66	.68	-.02	.61	.44	.34	.58	.85	.84
03				.04	-.05	-.06	-.07	.50	.49	.12	.46	.33	.13	.43	.51	.52
Program Graduates																
04					.12	.17	.43	.35	.34	-.07	.30	.23	.34	.22	.09	.20
05						.13	.44	.14	.17	-.22	.10	-.17	.29	-.21	-.07	-.04
06							.41	.21	.26	-.11	.25	.23	.26	-.03	.10	.14
07								.17	.23	-.31	.23	.24	.26	-.16	-.08	-.01
Survey Results																
08									.98	.29	.97	.58	.59	.63	.70	.77
09										.26	.95	.54	.61	.61	.69	.75
10											.26	.16	.18	-.02	.04	.05
11												.56	.57	.64	.69	.74
University Library																
12													.49	.16	.52	.52
Research Support																
13														.10	.32	.35
14															.66	.73
Publication Records																
15																.98
16																

NOTE: Since in computing correlation coefficients program data must be available for both of the measures being correlated, the actual number of programs on which each coefficient is based varies.

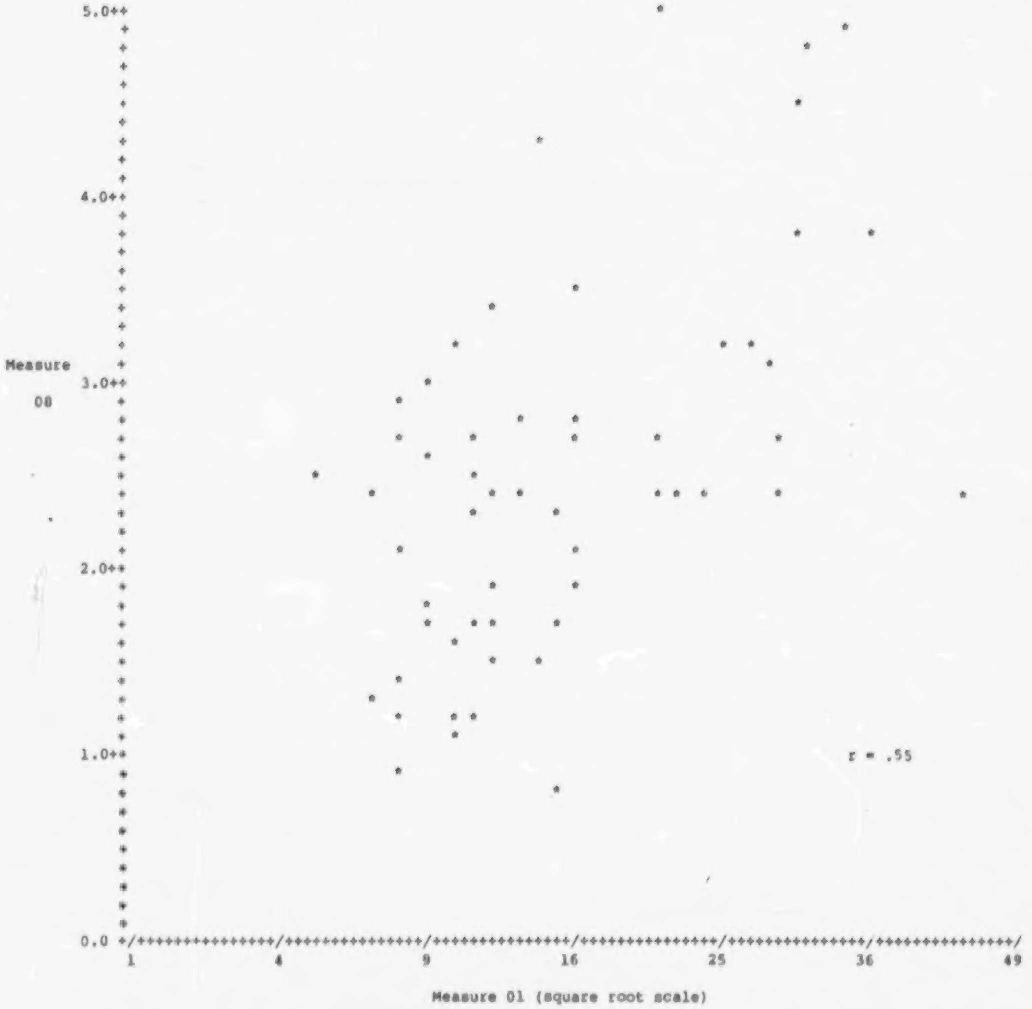

FIGURE 4.1 Mean rating of scholarly quality of faculty (measure 08) versus number of faculty members (measure 01)--57 programs in computer sciences.

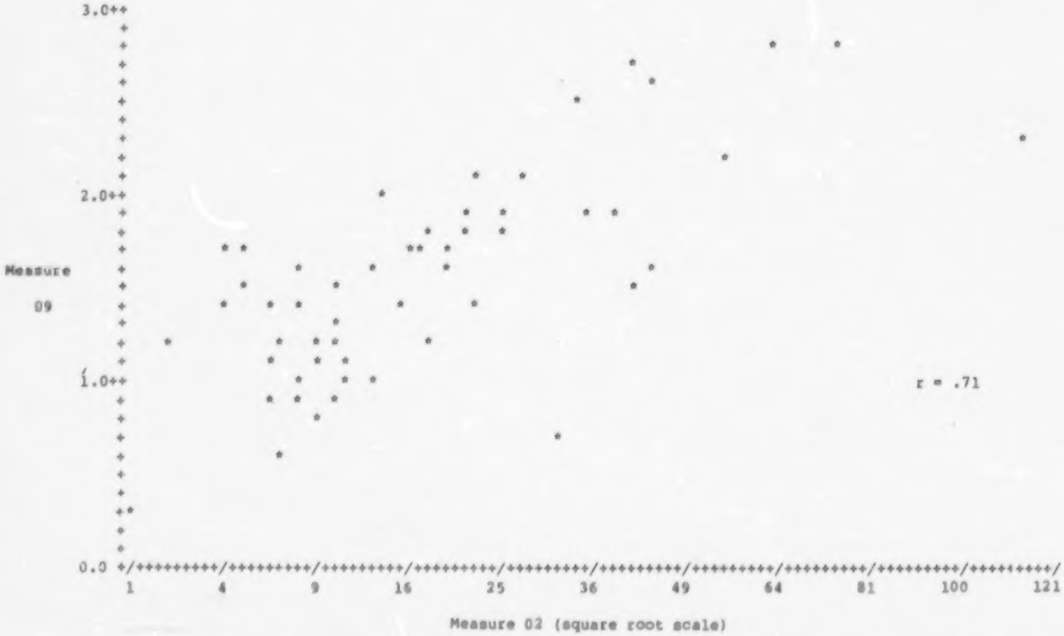

FIGURE 4.2 Mean rating of program effectiveness in educating research scholars/scientists (measure 09) versus number of graduates in last five years (measure 02)--56 programs in computer sciences.

TABLE 4.4 Characteristics of Survey Participants in Computer Sciences

	Respondents	
	N	%
Field of Specialization		
Computer Sciences	99	92
Other/Unknown	9	8
Faculty Rank		
Professor	41	38
Associate Professor	32	30
Assistant Professor	34	32
Other/Unknown	1	1
Year of Highest Degree		
Pre-1950	3	3
1950-59	11	10
1960-69	30	28
Post-1969	63	58
Unknown	1	1
Evaluator Selection		
Nominated by Institution	81	75
Other	27	25
Survey Form		
With Faculty Names	97	90
Without Names	11	10
Total Evaluators	108	100

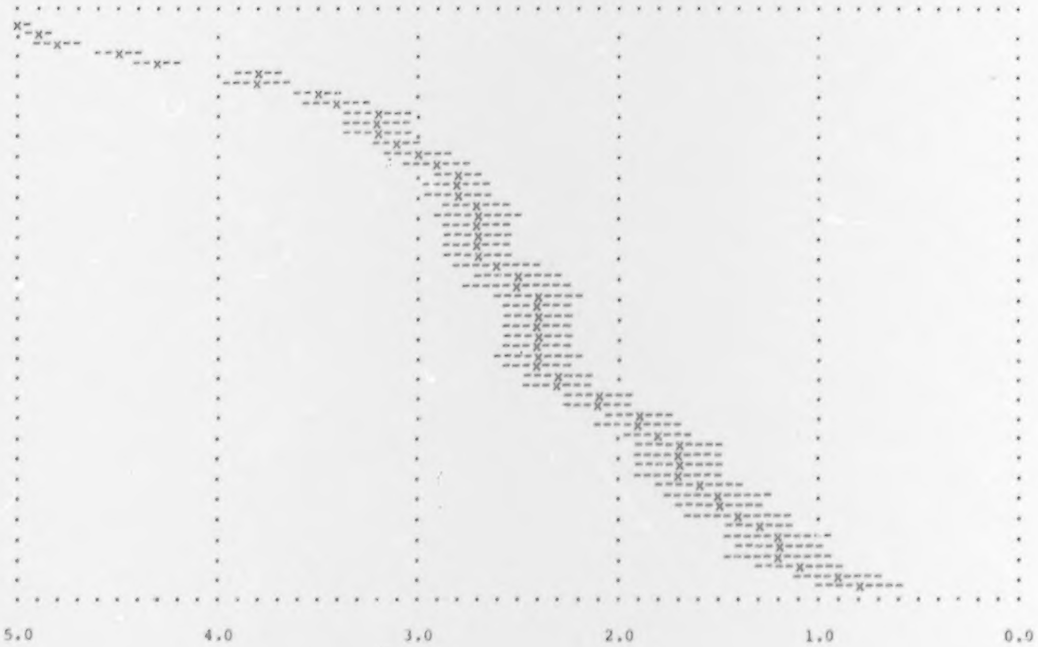

FIGURE 4.3 Mean rating of scholarly quality of faculty in 57 programs in computer sciences.

NOTE: Programs are listed in sequence of mean rating, with the highest-rated program appearing at the top of the page. The broken lines (---) indicate a confidence interval of ±1.5 standard errors around the reported mean (x) of each program.

V

Geoscience Programs

In this chapter 91 research-doctorate programs in the geosciences--including geology, geochemistry, geophysics, and general earth sciences--are assessed. These programs, according to the information supplied by their universities, have accounted for 1,747 doctoral degrees awarded during the FY1976-80 period--approximately 93 percent of the aggregate number of geoscience doctorates earned from U.S. universities in this five-year span.[1] On the average, 25 full-time and part-time students intending to earn doctorates were enrolled in a program in December 1980, with an average faculty size of 16 members.[2] The 91 programs, listed in Table 5.1, represent 82 different universities. The University of California (Berkeley), University of Missouri (Rolla), Ohio State University (Columbus), Princeton University, and Texas A&M University each have two geoscience programs included in the assessment, and Pennsylvania State University and Stanford University each have three. All but 5 of the 91 geoscience programs were initiated prior to 1970. In addition to the 82 universities represented in this discipline, another 5 were initially identified as meeting the criteria[3] for inclusion in the assessment:

University of California--San Diego
Colorado School of Mines
Colorado State University
North Carolina State University--Raleigh
University of Rochester

The Colorado School of Mines chose not to participate in the study in *any* of the disciplines. Geoscience programs at the other four institutions have not been included in the evaluations in this discipline, since in each case the study coordinator either indicated that the institution did not at that time have a research-doctorate program in geosciences or failed to provide the information requested by the committee.

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[1] Data from the NRC's Survey of Earned Doctorates indicate that 1,871 research doctorates in geosciences were awarded by U.S. universities between FY1976 and FY1980.

[2] See the reported means for measures 03 and 01 in Table 5.2.

[3] As mentioned in Chapter I, the primary criterion for inclusion was that a university had awarded at least 7 doctorates in the geosciences during the FY1976-78 period.

Before examining individual program results presented in Table 5.1, the reader is urged to refer to Chapter II, in which each of the 16 measures used in the assessment is discussed. Summary statistics describing every measure are given in Table 5.2. For nine of the measures, data are reported for at least 89 of the 91 geoscience programs. For measures 04-07, which pertain to characteristics of the program graduates, data are presented for only two-thirds of the programs; the other one-third had too few graduates on which to base statistics.[4] For measure 12, a composite index of the size of a university library, data are available for 69 programs; for measure 14, total university expenditures for research in this discipline, data are available for 73 programs. With respect to the measure 14, it should be noted that the reported data include expenditures for research in atmospheric sciences and oceanography as well as in the geosciences. The programs not evaluated on measures 12 and 14 are typically smaller--in terms of faculty size and graduate student enrollment--than other geoscience programs. Were data on measures 12 and 14 available for all 91 programs, it is likely that the reported means for these two measures would be appreciably lower (and that some of the correlations of these measures with others would be higher). With respect to measure 13, the fraction of faculty with research support from the National Science Foundation, the National Institutes of Health, and the Alcohol, Drug Abuse, and Mental Health Adminstration, data are reported for 72 programs that had at least 10 faculty members.

Intercorrelations among the 16 measures (Pearson product-moment coefficients) are given in Table 5.3. Of particular note are the high positive correlations of the measures of the numbers of doctoral graduates and students (02, 03) with measures of publication records (15-16) and reputational survey ratings (08, 09, and 11). Figure 5.1 illustrates the relationship between the mean rating of the scholarly quality of faculty (measure 08) and the number of faculty members (measure 01) for each of the 91 geoscience programs. Figure 5.2 plots the mean rating of program effectiveness (measure 09) against the total number of FY1976-80 program graduates (measure 02). Although in both figures there is a significant positive correlation between program size and reputational rating, it is quite apparent that some of the smaller programs received high mean ratings and some of the larger programs received low mean ratings.

Table 5.4 describes the 177 faculty members who participated in the evaluation of geoscience programs. These individuals constituted

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[4] As mentioned in Chapter II, data for measures 04-07 are not reported if they are based on the survey responses of fewer than 10 FY1975-79 program graduates.

[5] See Table 2.3 in Chapter II.

65 percent of those asked to respond to the survey in this discipline and 12 percent of the faculty population in the 91 research-doctorate programs being evaluated.[5] More than one-third of the survey participants were geologists, and approximately two-thirds held the rank of full professor. Almost three-fourths of them had earned their highest degree prior to 1970.

To assist the reader in interpreting results of the survey evaluations, estimated standard errors have been computed for mean ratings of the scholarly quality of faculty in 91 geoscience programs (and are given in Table 5.1). For each program the mean rating and an associated "confidence interval" of 1.5 standard errors are illustrated in Figure 5.3 (listed in order of highest to lowest mean rating). In comparing two programs, if their confidence intervals do not overlap, one may conclude that there is a significant difference in their mean ratings at a .05 level of significance.[6] From this figure it is also apparent that one should have somewhat more confidence in the accuracy of the mean ratings of higher-rated programs than lower-rated programs. This generalization results primarily from the fact that evaluators are not as likely to be familiar with the less prestigious programs, and consequently the mean ratings of these programs are usually based on fewer survey responses.

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[6] See pp. 29-31 for a discussion of the interpretation of mean ratings and associated confidence intervals.

TABLE 5.1 Program Measures (Raw and Standardized Values) in Geosciences

Prog No.	University - Department/Academic Unit	Program Size (01)	(02)	(03)	Characteristics of Program Graduates (04)	(05)	(06)	(07)
001.	Alaska, University of	52	6	11	NA	NA	NA	NA
	Geophysical Institute	*95*	*41*	*43*				
002.	Arizona State University-Tempe	19	8	15	.27	6.8	.64	.46
	*Geology**	*54*	*42*	*45*	*51*	*52*	*39*	*67*
003.	Arizona, University of-Tucson	26	27	40	.30	8.8	.52	.13
	*Geosciences**	*63*	*55*	*57*	*53*	*30*	*29*	*43*
004.	Boston University	6	9	1	.00	9.8	.58	.00
	Geology	*38*	*43*	*38*	*30*	*18*	*34*	*33*
005.	Brown University	16	20	43	.32	6.5	.81	.38
	Geological Sciences	*51*	*51*	*59*	*54*	*55*	*54*	*62*
006.	California Institute of Technology	28	60	69	.33	6.5	.64	.36
	Geological and Planetary Sciences	*65*	*78*	*71*	*55*	*55*	*39*	*60*
007.	California, University of-Santa Cruz	10	16	31	.06	5.8	.94	.29
	Earth Sciences	*43*	*48*	*53*	*35*	*63*	*65*	*55*
008.	California, University of-Berkeley	11	25	29	.16	6.1	.74	.26
	Geology	*44*	*54*	*52*	*42*	*59*	*47*	*53*
009.	California, University of-Berkeley	5	16	21	.21	6.3	.79	.29
	Geophysics	*37*	*48*	*48*	*46*	*57*	*52*	*55*
010.	California, University of-Davis	12	14	21	NA	NA	NA	NA
	Geology	*46*	*46*	*48*				
011.	California, University of-Los Angeles	39	58	68	.24	6.9	.70	.30
	Earth and Space Sciences	*79*	*77*	*71*	*48*	*51*	*44*	*56*
012.	California, University of-Riverside	8	7	7	NA	NA	NA	NA
	Earth Sciences	*41*	*42*	*41*				
013.	California, University of-Santa Barbara	18	18	42	.17	7.7	.92	.33
	Geological Sciences	*53*	*49*	*58*	*43*	*42*	*63*	*58*
014.	Case Western Reserve University	7	12	7	.62	6.8	.69	.23
	eological Sciences	*39*	*45*	*41*	*77*	*52*	*44*	*51*
015.	Chicago, University of	20	16	24	.36	5.7	.86	.43
	Geophysical Sciences							
016.	Cincinnati, University of	11	13	11	.15	7.3	.92	.08
	Geology	*44*	*46*	*43*	*42*	*46*	*63*	*40*
017.	Colorado, University of	19	35	39	.25	7.5	.81	.16
	Geological Sciences	*54*	*61*	*57*	*49*	*44*	*54*	*45*
018.	Columbia University	28	55	108	.22	6.7,	.85	.37
	Geological Sciences	*65*	*75*	*90*	*47*	*53*	*57*	*61*
019.	Cornell University-Ithaca	18	16	42	.36	5.8	.82	.46
	Geological Sciences	*53*	*48*	*58*	*58*	*63*	*54*	*67*
020.	Delaware, University of-Newark	10	14	9	.36	7.5	.79	.00
	Geology	*43*	*46*	*42*	*57*	*44*	*52*	*33*

* indicates program was initiated since 1970.

NOTE: On the first line of data for every program, raw values for each measure are reported; on the second line values are reported in standardized form, with mean = 50 and standard deviation = 10. "NA" indicates that the value for a measure is not available.

TABLE 5.1 Program Measures (Raw and Standardized Values) in Geosciences

Prog No.	Survey Results				University Library	Research Support		Published Articles		Survey Ratings Standard Error			
	(08)	(09)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(08)	(09)	(10)	(11)
001.	2.5	1.4	1.4	0.3	NA	.58	25987	56		.18	.16	.14	.05
	45	*41*	*58*	*35*		*55*	*99*	*53*	*49*				
002.	3.1	1.9	1.6	1.1	-0.3	.58	858	32		.08	.06	.08	.07
	52	*53*	*66*	*55*	*44*	*55*	*43*	*47*	*48*				
003.	3.7	2.2	1.8	1.2	0.9	.62	10111	72		.08	.06	.05	.07
	59	*60*	*74*	*60*	*55*	*57*	*64*	*57*	*63*				
004.	1.3	0.9	0.8	0.4	-0.4	NA	NA	11		.12	.09	.10	.06
	30	*29*	*39*	*38*	*43*			*42*	*41*				
005.	3.7	2.1	1.4	1.4	-1.1	.88	1479	35		.09	.06	.08	.07
	59	*59*	*59*	*65*	*37*	*69*	*44*	*48*	*50*				
006.	4.9	2.8	1.2	1.7	NA	.64	6414	145		.04	.05	.06	.05
	74	*73*	*54*	*73*		*58*	*56*	*76*	*77*				
007.	3.1	1.9	1.3	1.0	NA	.70	855	17		.08	.06	.07	.07
	52	*53*	*54*	*54*		*61*	*43*	*43*	*44*				
008.	4.1	2.2	0.8	1.4	2.2	.73	2232	110		.07	.06	.07	.07
	64	*61*	*36*	*65*	*68*	*62*	*46*	*67*	*71*				
009.	3.5	2.1	0.9	0.8	2.2	NA	2232	110		.12	.07	.10	.09
	57	*57*	*40*	*49*	*68*		*46*	*67*	*71*				
010.	2.9	1.8	1.2	1.0	0.6	.67	597	34		.09	.06	.09	.07
	50	*52*	*53*	*53*	*53*	*59*	*42*	*48*	*48*				
011.	4.5	2.4	1.4	1.5	2.0	.54	5359	171		.06	.06	.06	.06
	69	*65*	*59*	*69*	*66*	*53*	*53*	*83*	*85*				
012.	2.0	1.4	0.7	0.8	-1.0	NA	716	27		.12	.07	.09	.07
	38	*41*	*35*	*47*	*37*		*42*	*46*	*45*				
013.	3.7	2.2	1.6	1.3	-0.1	.50	2883	35		.08	.06	.07	.07
	59	*60*	*67*	*63*	*46*	*51*	*47*	*48*	*49*				
014.	2.2	1.3	0.3	0.7	-1.3	NA	NA	14		.11	.09	.08	.07
	41	*41*	*20*	*46*	*34*			*42*	*44*				
015.	4.3	2.3	1.2	1.4	0.9	.85	2186	80		.08	.07	.06	.07
	66	*61*	*54*	*63*	*55*	*68*	*46*	*59*	*63*				
016.	2.8	1.7	1.3	0.9	-0.2	.27	NA	10		.10	.07	.09	.07
	48	*48*	*56*	*51*	*44*	*41*		*41*	*42*				
017.	3.1	2.0	1.3	1.0	-0.9	.32	3977	79		.09	.05	.08	.06
	52	*55*	*54*	*54*	*38*	*43*	*50*	*59*	*56*				
018.	4.3	2.4	1.0	1.5	1.7	.71	13637	167		.08	.06	.07	.06
	67	*65*	*44*	*68*	*63*	*61*	*73*	*82*	*78*				
019.	4.0	2.3	1.7	1.4	1.6	.39	2887	84		.07	.06	.05	.06
	63	*62*	*70*	*66*	*62*	*46*	*47*	*60*	*63*				
020.	1.8	1.3	1.2	0.5	NA	.30	3086	33		.14	.11	.14	.07
	37	*39*	*51*	*39*		*42*	*48*	*47*	*47*				

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TABLE 5.1 Program Measures (Raw and Standardized Values) in Geosciences

Prog No.	University - Department/Academic Unit	Program Size			Characteristics of Program Graduates			
		(01)	(02)	(03)	(04)	(05)	(06)	(07)
021.	Florida State University-Tallahassee	10	11	16	NA	NA	NA	NA
	Geology	*43*	*44*	*46*				
022.	George Washington University	10	11	14	.09	8.5	NA	NA
	Geology	*43*	*44*	*45*	*37*	*33*		
023.	Harvard University	13	50	36	.42	6.2	.76	.36
	Geological Sciences	*47*	*71*	*55*	*62*	*59*	*49*	*60*
024.	Hawaii, University of	33	21	22	.31	8.3	.56	.19
	Geology and Geophysics	*72*	*51*	*49*	*54*	*35*	*33*	*47*
025.	Houston, University of	14	2	26	NA	NA	NA	NA
	*Geology**	*48*	*38*	*50*				
026.	Idaho, University of-Moscow	13	21	NA	.19	7.3	.65	.15
	Geology	*47*	*51*		*45*	*47*	*40*	*45*
027.	Illinois, University-Urbana/Champaign	20	32	64	.24	6.8	.79	.30
	Geology	*55*	*59*	*69*	*48*	*52*	*52*	*56*
028.	Indiana University-Bloomington	23	25	16	.16	5.9	.81	.38
	Geology	*59*	*54*	*46*	*42*	*62*	*54*	*61*
029.	Iowa State University-Ames	18	6	9	NA	NA	NA	NA
	Earth Sciences	*53*	*41*	*42*				
030.	Iowa, University of-Iowa City	14	19	68	.31	7.0	.72	.28
	Geology	*48*	*50*	*71*	*54*	*50*	*46*	*54*
031.	Johns Hopkins University	11	27	41	.44	5.5	.89	.44
	Earth and Planetary Sciences	*44*	*55*	*58*	*64*	*66*	*60*	*66*
032.	Kansas, University of	18	17	18	.14	7.3	.82	.18
	Geology	*53*	*48*	*47*	*40*	*46*	*54*	*47*
033.	Kentucky, University of	9	5	7	NA	NA	NA	NA
	Geology	*42*	*40*	*41*				
034.	Lehigh University	9	7	4	NA	NA	NA	NA
	Geological Sciences	*42*	*42*	*40*				
035.	Louisiana State University-Baton Rouge	17	9	83	.20	8.5	NA	NA
	Geology	*52*	*43*	*78*	*45*	*33*		
036.	Massachusetts Institute of Technology	25	87	107	.21	6.0	.77	.37
	Earth and Planetary Sciences	*62*	*97*	*90*	*46*	*61*	*50*	*61*
037.	Massachusetts, University of-Amherst	16	18	25	.19	8.3	.75	.13
	Geology and Geography	*51*	*49*	*50*	*44*	*35*	*49*	*43*
038.	Miami, University of-Florida	17	14	25	NA	NA	NA	NA
	Marine Geol & Geophys/ Marine & Atmos Chem	*52*	*46*	*50*				
039.	Michigan State University-East Lansing	14	11	9	.29	7.0	1.00	.29
	Geology	*48*	*44*	*42*	*52*	*50*	*70*	*55*
040.	Michigan, University of-Ann Arbor	20	20	10	.33	7.0	.80	.33
	Geological Sciences	*55*	*51*	*43*	*55*	*50*	*53*	*58*

* indicates program was initiated since 1970.

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TABLE 5.1 Program Measures (Raw and Standardized Values) in Geosciences

Prog No.	Survey Results				University Library	Research Support		Published Articles		Survey Ratings Standard Error			
	(08)	(09)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(08)	(09)	(10)	(11)
021.	2.2	1.4	1.0	0.7	-0.4	.30	2610	37		.10	.09	.10	.07
	41	*42*	*45*	*44*	*43*	*42*	*47*	*48*	*44*				
022.	1.6	1.0	0.9	0.3	NA	.20	738	10		.14	.14	.12	.05
	33	*34*	*40*	*33*		*38*	*42*	*41*	*41*				
023.	4.1	2.4	0.9	1.5	3.0	.85	2324	96		.08	.06	.08	.06
	65	*64*	*42*	*68*	*75*	*68*	*46*	*63*	*70*				
024.	2.9	1.6	1.3	0.9	-0.1	.52	9001	48		.11	.08	.08	.07
	50	*47*	*56*	*51*	*45*	*52*	*62*	*51*	*53*				
025.	2.2	1.1	1.3	0.6	-0.9	.07	610	25		.11	.08	.08	.06
	42	*36*	*55*	*41*	*38*	*33*	*42*	*45*	*42*				
026.	1.6	1.1	1.1	0.3	NA	.08	846	3		.11	.12	.08	.06
	34	*35*	*48*	*35*		*32*	*42*	*40*	*41*				
027.	3.2	1.9	0.9	1.0	2.0	.30	7160	53		.08	.06	.10	.07
	53	*54*	*42*	*54*	*65*	*42*	*57*	*52*	*51*				
028.	3.2	2.0	1.3	0.9	0.9	.44	NA	28		.09	.07	.07	.08
	53	*57*	*56*	*51*	*56*	*49*		*46*	*44*				
029.	2.2	1.2	1.2	0.4	-0.5	.33	1082	13		.10	.13	.10	.06
	41	*37*	*52*	*38*	*42*	*44*	*43*	*42*	*42*				
030.	2.4	1.7	1.2	0.6	0.3	.14	NA	64		.15	.10	.10	.07
	44	*48*	*51*	*41*	*49*	*35*		*55*	*51*				
031.	3.6	2.1	1.0	1.0	-0.4	.82	2656	21		.08	.07	.08	.07
	58	*59*	*43*	*53*	*43*	*66*	*47*	*44*	*46*				
032.	2.9	1.8	1.0	0.8	0.1	.33	2945	23		.08	.06	.06	.07
	49	*50*	*44*	*49*	*48*	*44*	*48*	*45*	*44*				
033.	2.1	1.0	1.3	0.6	-0.1	NA	638	5		.09	.09	.15	.07
	40	*33*	*55*	*41*	*46*		*42*	*40*	*41*				
034.	2.1	1.2	0.9	0.6	NA	NA	NA	8		.13	.09	.09	.06
	40	*38*	*41*	*44*				*41*	*42*				
035.	2.5	1.7	1.3	0.6	-0.3	.29	6501	25		.11	.09	.11	.07
	44	*48*	*54*	*44*	*44*	*42*	*56*	*45*	*44*				
036.	4.8	2.7	1.5	1.6	-0.3	.92	8537	147		.05	.05	.07	.06
	72	*72*	*61*	*70*	*44*	*71*	*61*	*77*	*78*				
037.	3.0	1.8	1.4	1.0	-0	.44	2734	38		.09	.07	.08	.07
	51	*52*	*58*	*53*	*40*	*49*	*47*	*49*	*50*				
038.	3.1	1.9	1.2	0.8	NA	.65	11765	41		.11	.07	.10	.07
	52	*52*	*53*	*48*		*58*	*68*	*49*	*50*				
039.	2.4	1.5	1.0	0.7	0.3	.21	2535	18		.10	.08	.09	.07
	44	*45*	*45*	*46*	*50*	*38*	*47*	*43*	*43*				
040.	3.5	2.1	1.2	1.2	1.8	.75	12188	102		.09	.05	.08	.07
	57	*59*	*51*	*59*	*64*	*63*	*69*	*65*	*61*				

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TABLE 5.1 Program Measures (Raw and Standardized Values) in Geosciences

Prog No.	University - Department/Academic Unit	Program Size			Characteristics of Program Graduates			
		(01)	(02)	(03)	(04)	(05)	(06)	(07)
041.	Minnesota, University of	21	20	22	.13	7.3	.71	.08
	Geology and Geophysics	*57*	*51*	*49*	*40*	*40*	*45*	*40*
042.	Missouri, University of-Columbia	8	5	6	NA	NA	NA	NA
	Geology	*41*	*40*	*41*				
043.	Missouri, University of-Rolla	6	2	5	NA	NA	NA	NA
	eological Engineering	*36*	*38*	*40*				
044.	Missouri, University of-Rolla	8	9	4	NA	NA	NA	NA
	Geology/Geophysics	*41*						
045.	Montana, University of-Missoula	13	8	6	.20	6.0	.80	.10
	Geology	*47*	*42*	*41*	*45*	*61*	*53*	*41*
046.	New Mexico Institute of Mining & Technology	24	12	9	.18	7.5	.73	.00
	Geoscience	*60*	*45*	*42*	*44*	*44*	*47*	*33*
047.	New Mexico, University of-Albuquerque	14	16	NA	NA	NA	NA	NA
	Geology	*48*	*48*					
048.	North Carolina, University of-Chapel Hill	15	19	7	.11	6.5	.84	.21
	Geology	*49*	*50*	*41*	*38*	*55*	*56*	*49*
049.	North Dakota, University of-Grand Forks	8	10	18	NA	NA	NA	NA
	Geology	*41*	*44*	*47*				
050.	Northwestern University	13	14	18	.20	6.8	.87	.27
	Geological Sciences	*47*	*46*	*47*	*45*	*52*	*59*	*53*
051.	Ohio State University-Columbus	4	14	27	.07	7.3	.50	.14
	Geodetic Science	*36*	*46*	*51*	*35*	*46*	*27*	*44*
052.	Ohio State University-Columbus	26	23	29	.25	7.4	.70	.17
	Geology and Mineralogy	*63*	*53*	*52*	*50*	*46*	*44*	*46*
053.	Oklahoma, University of-Norman	13	5	11	NA	NA	NA	NA
	Geology and Geophysics	*47*	*40*	*43*				
054.	Oregon State University-Corvallis	12	9	10	.50	7.5	.70	.10
	Geology	*46*	*43*	*43*	*68*	*44*	*44*	*41*
055.	Oregon, University of-Eugene	13	11	15	.46	6.5	.82	.18
	Geology	*47*	*44*	*45*	*65*	*55*	*54*	*47*
056.	Pennsylvania State University	17	8	33	.17	6.6	.77	.26
	Geochemistry and Mineralogy	*52*	*42*	*54*	*43*	*54*	*50*	*53*
057.	Pennsylvania State University	14	33	27	.37	6.1	.85	.18
	Geology	*48*	*60*	*51*	*58*	*60*	*57*	*47*
058.	Pennsylvania State University	7	5	15	NA	NA	NA	NA
	Geophysics	*39*	*40*	*45*				
059.	Pittsburgh, University of	12	17	12	.13	8.8	.63	.25
	Geology and Planetary Science	*46*	*48*	*44*	*40*	*30*	*38*	*52*
060.	Princeton University	17	28	40	.32	5.9	.91	.23
	Geological and Geophysical Sciences	*52*	*56*	*57*	*54*	*62*	*62*	*50*

* indicates program was initiated since 1970.

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TABLE 5.1 Program Measures (Raw and Standardized Values) in Geosciences

Prog No.	Survey Results				University Library	Research Support		Published Articles		Survey Ratings Standard Error			
	(08)	(09)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(08)	(09)	(10)	(11)
041.	3.3	2.0	1.1	1.1	1.2	.62	2617	65		.08	.05	.06	.05
	54	*55*	*48*	*56*	*58*	*57*	*47*	*55*	*53*				
042.	2.2	1.4	0.8	0.5	-0.2	NA	NA	19		.13	.09	.11	.06
	41	*41*	*39*	*40*	*45*			*44*	*43*				
043.	1.3	0.7	NA	0.2	NA	NA	NA	10		.24	.20	NA	.05
	30	*26*		*31*				*41*	*42*				
044.	1.8	1.1	0.9	0.4	NA	NA	NA	10		.19	.16	.09	.06
	36	*35*	*41*	*36*				*41*	*42*				
045.	2.2	1.5	1.2	0.6	NA	.23	NA	0		.11	.11	.11	.07
	41	*45*	*51*	*42*		*39*		*39*	*40*				
046.	2.5	1.6	1.3	0.6	NA	.21	1962	12		.11	.10	.09	.07
	44	*47*	*56*	*43*		*38*	*45*	*42*	*42*				
047.	2.7	1.7	1.3	0.8	-1.0	.14	892	19		.09	.07	.09	.07
	47	*48*	*56*	*48*	*37*	*35*	*43*	*44*	*43*				
048.	2.9	1.9	1.4	0.9	1.0	.47	3087	17		.10	.05	.08	.07
	50	*53*	*58*	*51*	*56*	*50*	*48*	*43*	*44*				
049.	1.4	0.8	0.9	0.3	NA	NA	703	1		.15	.14	.15	.06
	31	*27*	*41*	*35*			*42*	*39*	*40*				
050.	3.6	2.1	0.8	1.2	0.3	.77	NA	32		.08	.05	.08	.06
	58	*57*	*36*	*58*	*50*	*64*		*47*	*49*				
051.	3.2	1.7	NA	0.2	0.9	NA	1320	54		.29	.16	NA	.05
	53	*49*		*32*	*55*		*44*	*53*	*46*				
052.	2.9	1.8	1.1	0.8	0.9	.50	1320	54		.10	.07	.08	.07
	50	*51*	*50*	*49*	*55*	*51*	*44*	*53*	*46*				
053.	2.6	1.5	0.8	0.8	-0.6	.23	3117	10		.11	.08	.08	.07
	46	*43*	*37*	*47*	*41*	*39*	*48*	*41*	*41*				
054.	2.6	1.6	1.2	1.0	NA	.50	9024	52		.09	.07	.07	.07
	45	*47*	*51*	*52*		*51*	*62*	*52*	*52*				
055.	3.0	1.9	1.1	1.0	-0.9	.62	617	14		.09	.05	.07	.07
	50	*53*	*47*	*53*	*38*	*57*	*42*	*42*	*43*				
056.	3.9	2.2	1.2	1.0	0.7	.59	6180	54		.09	.08	.09	.08
	62	*60*	*51*	*54*	*53*	*56*	*55*	*53*	*54*				
057.	3.3	2.0	0.9	0.8	0.7	.36	6180	54		.10	.07	.08	.07
	54	*55*	*42*	*49*	*53*	*45*	*55*	*53*	*54*				
058.	3.0	1.8	1.2	0.5	0.7	NA	6180	54		.13	.08	.08	.07
	51	*50*	*52*	*41*	*53*		*55*	*53*	*54*				
059.	2.3	1.4	1.0	0.5	0.1	.33	1044	24		.12	.10	.11	.06
	42	*42*	*44*	*40*	*47*	*44*	*43*	*45*	*44*				
060.	4.0	2.3	1.1	1.5	0.9	.71	2832	48		.07	.06	.07	.05
	63	*62*	*48*	*69*	*55*	*61*	*47*	*51*	*53*				

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TABLE 5.1 Program Measures (Raw and Standardized Values) in Geosciences

Prog No.	University - Department/Academic Unit	Program Size			Characteristics of Program Graduates			
		(01)	(02)	(03)	(04)	(05)	(06)	(07)
061.	Princeton University	17	9	12	NA	NA	NA	NA
	Geophysical Fluid Dynamics	*52*	*43*	*44*				
062.	Purdue University-West Lafayette	22	19	15	.36	7.8	.70	.00
	Geosciences	*58*	*50*	*45*	*58*	*41*	*44*	*33*
063.	Rensselaer Polytechnic Institute	7	8	8	.31	6.3	1.00	.00
	Geology	*39*	*42*	*42*	*54*	*58*	*70*	*33*
064.	Rice University	11	33	25	.27	5.5	.76	.10
	Geology	*44*	*60*	*50*	*50*	*67*	*49*	*41*
065.	SUNY at Albany	8	6	29	NA	NA	NA	NA
	*Geological Sciences**	*41*	*41*	*52*				
066.	SUNY at Binghamton	10	12	11	.36	7.5	.70	.20
	Geological Sciences	*43*	*45*	*43*	*58*	*44*	*44*	*48*
067.	SUNY at Stony Brook	25	25	28	.16	7.0	.94	.33
	Earth and Space Sciences	*62*	*54*	*51*	*42*	*50*	*65*	*58*
068.	Saint Louis University	5	10	17	NA	NA	NA	NA
	Earth and Atmospheric Sciences	*37*	*44*	*46*				
069.	South Carolina, University of-Columbia	20	45	20	.08	6.2	.87	.32
	Geology	*55*	*68*	*48*	*36*	*58*	*58*	*57*
070.	Southern California, University of	13	19	26	.18	7.8	.92	.31
	Geological Sciences	*47*	*50*	*50*	*43*	*40*	*63*	*56*
071.	Southern Methodist University	10	11	14	.80	6.8	NA	NA
	Geological Sciences	*43*	*44*	*45*	*91*	*52*		
072.	Stanford University	10	26	23	.26	6.9	.87	.10
	*Applied Earth Sciences**	*43*	*55*	*49*	*50*	*51*	*59*	*41*
073.	Stanford University	14	54	45	.23	7.3	.83	.19
	Geology	*48*	*74*	*60*	*48*	*47*	*56*	*48*
074.	Stanford University	8	33	39	.41	5.3	.82	.19
	Geophysics	*41*	*60*	*57*	*61*	*69*	*54*	*47*
075.	Syracuse University	9	20	11	.33	8.0	.61	.00
	Geology	*42*	*51*	*43*	*55*	*39*	*37*	*33*
076.	Tennessee, University of-Knoxville	9	9	8	NA	NA	NA	NA
	Geological Sciences	*42*	*43*	*42*				
077.	Texas A & M University	17	10	14	.18	6.2	.82	.09
	Geology	*52*	*44*	*45*	*44*	*59*	*54*	*40*
078.	Texas A & M University	14	11	11	.30	7.5	.60	.00
	Geophysics	*48*	*44*	*43*	*53*	*44*	*36*	*33*
079.	Texas, University of-Austin	37	33	50	.36	7.6	.80	.20
	Geological Sciences	*77*	*60*	*62*	*58*	*43*	*53*	*48*
080.	Texas, University of-Dallas	12	17	35	.13	6.7	.71	.43
	Geosciences	*46*	*48*	*55*	*40*	*53*	*45*	*65*

* indicates program was initiated since 1970.

NOTE: On the first line of data for every program, raw values for each measure are reported; on the second line values are reported in standardized form, with mean = 50 and standard deviation = 10. "NA" indicates that the value for a measure is not available.

TABLE 5.1 Program Measures (Raw and Standardized Values) in Geosciences

Prog	Survey Results				University Library	Research Support		Published Articles		Survey Ratings Standard Error			
No.	(08)	(09)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(08)	(09)	(10)	(11)
061.	4.2	2.2	1.2	0.6	0.9	.47	2832	48		.11	.11	.11	.07
	65	*61*	*51*	*43*	*55*	*50*	*47*	*51*	*53*				
062.	2.8	1.7	1.5	0.8	-0.5	.36	776	29		.10	.07	.10	.07
	49	*49*	*64*	*47*	*42*	*45*	*42*	*46*	*48*				
063.	2.4	1.4	1.0	0.7	NA	NA	NA	14		.11	.08	.07	.07
	44	*43*	*45*	*46*				*42*	*43*				
064.	2.6	1.6	0.5	1.0	-1.4	.27	NA	34		.08	.08	.08	.07
	47	*47*	*27*	*54*	*33*	*41*		*48*	*48*				
065.	3.5	.8	1.2	1.2	-1.0	NA	2528	29		.11	.07	.06	.08
	57	*52*	*50*	*60*	*37*		*47*	*46*	*47*				
066.	2.6	1.6	0.9	0.8	NA	.50	NA	11		.09	.08	.07	.06
	46	*46*	*40*	*49*		*51*		*42*	*42*				
067.	3.7	2.1	1.2	1.2	-0.6	.60	3096	40		.08	.06	.08	.07
	59	*58*	*52*	*58*	*41*	*56*	*48*	*49*	*50*				
068.	2.1	1.5	1.0	0.4	NA	NA	672	17		.21	.11	.12	.07
	39	*45*	*43*	*38*			*42*	*43*	*43*				
069.	2.9	1.7	1.7	0.9	-0.4	.50	1626	23		.11	.09	.07	.08
	50	*50*	*70*	*51*	*43*	*51*	*44*	*45*	*43*				
070.	3.1	1.9	1.3	1.0	0.4	.62	3284	23		.08	.05	.07	.07
	52	*54*	*56*	*55*	*50*	*57*	*48*	*45*	*44*				
071.	2.5	1.6	1.2	0.8	NA	.40	NA	5		.09	.07	.08	.07
	45	*46*	*51*	*49*		*47*		*40*	*41*				
072.	3.4	2.1	0.8	0.9	2.0	.40	2790	123		.12	.09	.09	.07
	56	*57*	*38*	*51*	*66*	*47*	*47*	*70*	*67*				
073.	3.7	2.3	0.6	1.4	2.0	.50	2790	123		.09	.06	.08	.07
	60	*62*	*29*	*63*	*66*	*51*	*47*	*70*	*67*				
074.	4.2	2.5	1.4	1.1	2.0	NA	2790	123		.07	.08	.07	.08
	66	*66*	*59*	*57*	*66*		*47*	*70*	*67*				
075.	2.3	1.5	0.9	0.6	-0.3	NA	NA	2		.10	.10	.08	.07
	42	*44*	*42*	*43*	*43*			*39*	*40*				
076.	2.0	1.3	1.1	0.7	-0.4	NA	689	15		.09	.08	.09	.06
	39	*40*	*48*	*44*	*43*		*42*	*43*	*45*				
077.	3.0	1.8	1.3	0.9	-0.5	.24	5745	54		.10	.07	.08	.07
	50	*50*	*56*	*50*	*42*	*39*	*54*	*53*	*50*				
078.	3.1	1.8	1.5	0.8	-0.5	.29	5745	54		.11	.07	.10	.07
	53	*50*	*61*	*48*	*42*	*42*	*54*	*53*	*50*				
079.	3.8	2.2	1.4	1.4	1.6	.32	10789	62		.08	.05	.06	.06
	60	*60*	*60*	*64*	*62*	*43*	*66*	*55*	*50*				
080.	2.6	1.7	1.2	0.8	NA	.75	652	NA		.09	.07	.09	.07
	46	*49*	*52*	*49*		*63*	*42*		*NA*				

NOTE: On the first line of data for every program, raw values for each measure are reported; on the second line values are reported in standardized form, with mean = 50 and standard deviation = 10. "NA" indicates that the value for a measure is not available. Since the scale used to compute measure (16) is entirely arbitrary, only values in standardized form are reported for this measure.

TABLE 5.1 Program Measures (Raw and Standardized Values) in Geosciences

Prog No.	University - Department/Academic Unit	Program Size			Characteristics of Program Graduates			
		(01)	(02)	(03)	(04)	(05)	(06)	(07)
081.	Tulsa, University of	5	7	14	NA	NA	NA	NA
	Geosciences	*37*	*42*	*45*				
082.	Utah, University of-Salt Lake City	24	20	30	.21	7.5	.64	.07
	Geology and Geophysics	*60*	*51*	*52*	*46*	*44*	*39*	*39*
083.	Virginia Polytechnic Institute & State Univ	22	13	12	NA	NA	NA	NA
	Geological Sciences	*58*	*46*	*44*				
084.	Virginia, University of	26	17	25	.18	7.8	.46	.09
	Environmental Sciences	*63*	*48*	*50*	*44*	*41*	*23*	*40*
085.	Washington State University-Pullman	10	13	9	NA	NA	NA	NA
	Geology	*43*	*46*	*42*				
086.	Washington University-Saint Louis	12	4	18	NA	NA	NA	NA
	Earth and Planetary Sciences	*46*	*40*	*47*				
087.	Washington, University of-Seattle	17	41	16	.29	6.2	.73	.40
	Geological Sciences	*52*	*65*	*46*	*52*	*58*	*46*	*63*
088.	West Virginia University	16	12	5	NA	NA	NA	NA
	Geology and Geography	*51*	*45*	*40*				
089.	Wisconsin, University of-Madison	19	33	45	.22	6.4	.87	.27
	Geology and Geophysics	*54*	*60*	*60*	*47*	*57*	*59*	*53*
090.	Wyoming, University of	17	18	22	.39	7.0	.69	.15
	Geology	*52*	*49*	*49*	*59*	*50*	*44*	*45*
091.	Yale University	23	33	40	.27	6.1	.83	.53
	Geology and Geophysics	*59*	*60*	*57*	*50*	*60*	*56*	*73*

* indicates program was initiated since 1970.

NOTE: On the first line of data for every program, raw values for each measure are reported; on the second line values are reported in standardized form, with mean = 50 and standard deviation = 10. "NA" indicates that the value for a measure is not available.

TABLE 5.1 Program Measures (Raw and Standardized Values) in Geosciences

Prog	Survey Results				University Library	Research Support		Published Articles		Survey Ratings Standard Error			
No.	(08)	(09)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(08)	(09)	(10)	(11)
081.	1.0	0.7	0.7	0.3	NA	NA	NA	9		.15	.11	.19	.05
	26	*25*	*33*	*34*				*41*	*41*				
082.	3.0	1.9	1.4	0.8	-0.6	.33	3853	29		.10	.05	.09	.07
	51	*53*	*60*	*49*	*41*	*44*	*50*	*46*	*46*				
083.	3.7	2.1	1.6	1.3	-0.0	.59	2586	48		.08	.06	.07	.07
	59	*58*	*66*	*61*	*46*	*56*	*47*	*51*	*50*				
084.	2.3	1.4	1.4	0.4	0.7	.27	1394	13		.15	.12	.19	.06
	43	*42*	*59*	*36*	*54*	*41*	*44*	*42*	*45*				
085.	2.1	1.3	1.0	0.5	-0.3	.10	NA	14		.12	.10	.07	.07
	40	*40*	*46*	*39*	*44*	*33*		*42*	*43*				
086.	2.7	1.8	1.7	0.6	-0.4	.50	830	19		.13	.10	.09	.08
	47	*50*	*70*	*43*	*43*	*51*	*43*	*44*	*44*				
087.	3.3	2.0	1.2	1.2	1.5	.47	13047	90		.08	.05	.07	.07
	55	*56*	*50*	*58*	*61*	*50*	*71*	*62*	*65*				
088.	2.1	1.3	1.1	0.4	NA	.06	644	9		.15	.12	.12	.06
	40	*40*	*49*	*36*		*31*	*42*	*41*	*42*				
089.	3.7	2.3	1.1	1.2	1.6	.74	11910	86		.08	.06	.07	.07
	60	*62*	*48*	*60*	*62*	*63*	*68*	*61*	*55*				
090.	2.8	1.8	1.3	0.8	NA	.47	2474	21		.08	.07	.09	.07
	48	*50*	*55*	*48*		*50*	*46*	*44*	*44*				
091.	4.1	2.3	0.8	1.5	2.1	.78	715	36		.08	.07	.07	.06
	64	*62*	*37*	*68*	*67*	*65*	*42*	*48*	*51*				

NOTE: On the first line of data for every program, raw values for each measure are reported; on the second line values are reported in standardized form, with mean = 50 and standard deviation = 10. "NA" indicates that the value for a measure is not available. Since the scale used to compute measure (16) is entirely arbitrary, only values in standardized form are reported for this measure.

TABLE 5.2 Summary Statistics Describing Each Program Measure--Geosciences

Measure	Number of Programs Evaluated	Mean	Standard Deviation	DECILES								
				1	2	3	4	5	6	7	8	9
Program Size												
01 Raw Value	91	16	8	7	9	10	12	14	17	18	20	25
Std Value	91	50	10	39	42	43	46	48	52	53	55	62
02 Raw Value	91	19	15	6	9	11	12	16	18	20	27	33
Std Value	91	50	10	41	43	44	45	48	49	51	55	60
03 Raw Value	89	25	21	7	9	12	15	18	24	28	39	45
Std Value	89	50	10	41	42	44	45	47	50	51	57	60
Program Graduates												
04 Raw Value	66	.26	.13	.12	.16	.18	.21	.24	.28	.31	.36	.39
Std Value	66	50	10	39	42	44	46	48	52	54	58	60
05 Raw Value	66	7.0	.9	8.3	7.7	7.5	7.3	6.9	6.7	6.5	6.2	5.9
Std Value	66	50	10	35	42	44	46	51	53	55	59	62
06 Raw Value	63	.77	.12	.60	.68	.70	.74	.79	.81	.82	.86	.92
Std Value	63	50	10	36	43	44	48	52	53	54	58	63
07 Raw Value	63	.22	.13	.00	.10	.14	.18	.21	.27	.30	.34	.39
Std Value	63	50	10	33	41	44	47	49	54	56	59	63
Survey Results												
08 Raw Value	91	2.9	.8	2.0	2.2	2.5	2.7	2.9	3.1	3.3	3.7	4.1
Std Value	91	50	10	39	41	45	47	50	52	55	59	64
09 Raw Value	91	1.8	.4	1.1	1.4	1.5	1.7	1.8	1.9	2.0	2.1	2.3
Std Value	91	50	10	35	42	44	49	51	53	56	58	63
10 Raw Value	89	1.1	.3	.8	.9	1.0	1.1	1.2	1.2	1.3	1.4	1.5
Std Value	89	50	10	37	41	45	49	52	52	56	60	63
11 Raw Value	91	.9	.4	.4	.5	.6	.8	.8	.9	1.0	1.2	1.4
Std Value	91	50	10	37	40	43	48	48	51	54	59	65
University Library												
12 Raw Value	69	.4	1.0	-1.0	-.6	-.4	-.3	.0	.7	.9	1.5	2.0
Std Value	69	50	10	37	41	43	44	47	53	55	61	66
Research Support												
13 Raw Value	72	.47	.22	.20	.27	.32	.38	.47	.50	.60	.66	.75
Std Value	72	50	10	38	41	43	46	50	51	56	59	63
14 Raw Value	73	3996	4279	677	840	1320	2250	2637	2873	3341	6180	9785
Std Value	73	50	10	42	43	44	46	47	47	48	55	64
Publication Records												
15 Raw Value	90	44	39	9	13	17	23	32	38	54	64	102
Std Value	90	50	10	41	42	43	45	47	49	53	55	65
16 Std Value	90	50	10	41	42	43	44	46	49	51	54	67

NOTE: Standardized values reported in the preceding table have been computed from exact values of the mean and standard deviation and not the rounded values reported here. Since the scale used to compute measure 16 is entirely arbitrary, only data in standardized form are reported for this measure.

TABLE 5.3 Intercorrelations Among Program Measures on 91 Programs in Geosciences

	Measure															
	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16
Program Size																
01		.42	.40	-.06	-.08	-.14	.21	.45	.42	.47	.39	.22	.18	.61	.39	.36
02			.72	-.01	.29	.05	.36	.64	.67	.06	.67	.43	.40	.25	.73	.74
03				-.04	.16	.06	.45	.61	.62	.17	.59	.30	.33	.28	.66	.64
Program Graduates																
04					.24	.00	.04	.08	.10	-.10	.17	-.01	.09	.22	.03	.07
05						.51	.49	.50	.51	-.09	.44	.26	.38	-.05	.27	.31
06							.30	.24	.29	-.13	.35	.10	.20	-.04	.01	.00
07								.58	.58	.05	.59	.31	.61	.06	.33	.39
Survey Results																
08									.97	.29	.87	.58	.72	.27	.75	.77
09										.29	.87	.58	.72	.25	.73	.75
10											.19	-.08	.02	.13	.09	.09
11												.43	.70	.18	.66	.70
University Library																
12													.36	.33	.66	.66
Research Support																
13														.20	.45	.51
14															.42	.35
Publication Records																
15																.97
16																

NOTE: Since in computing correlation coefficients program data must be available for both of the measures being correlated, the actual number of programs on which each coefficient is based varies.

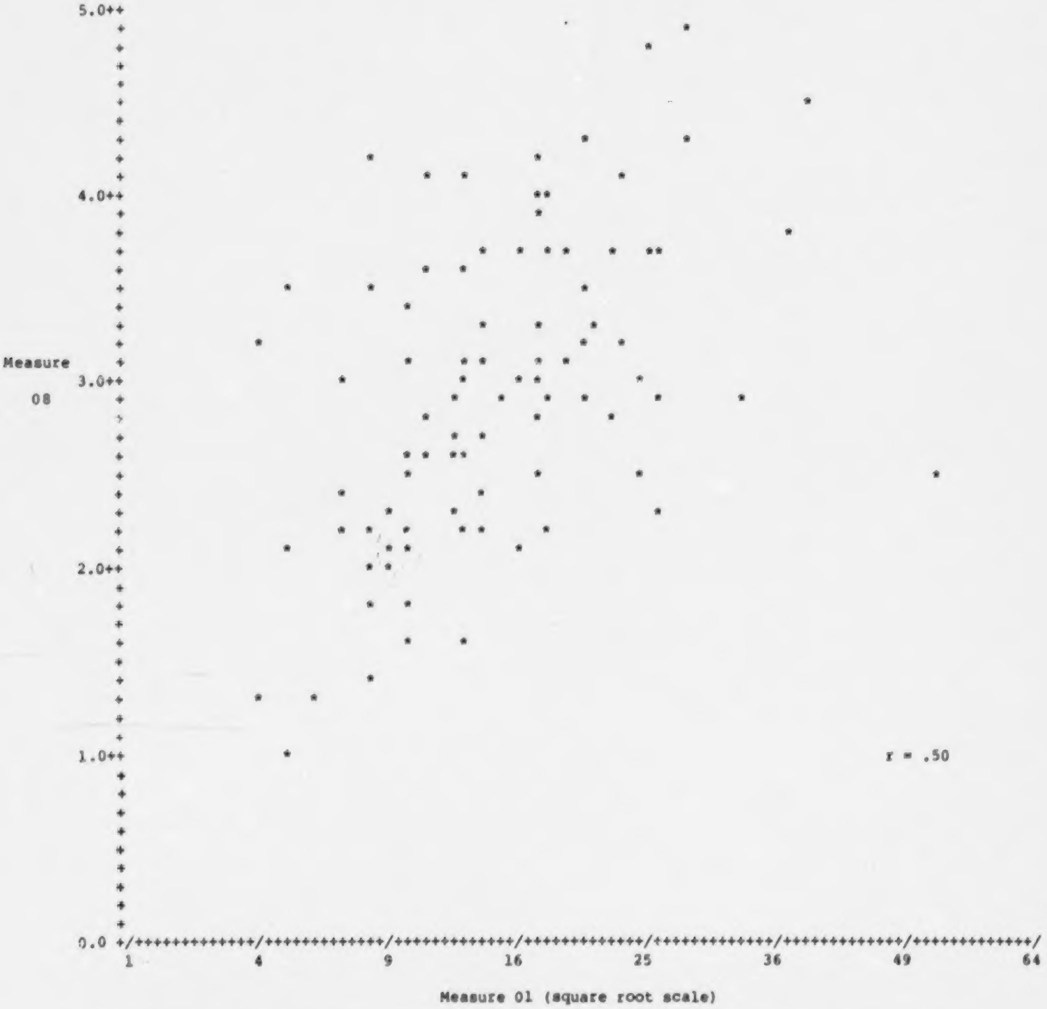

FIGURE 5.1 Mean rating of scholarly quality of faculty (measure 08) versus number of faculty members (measure 01)--91 programs in geosciences.

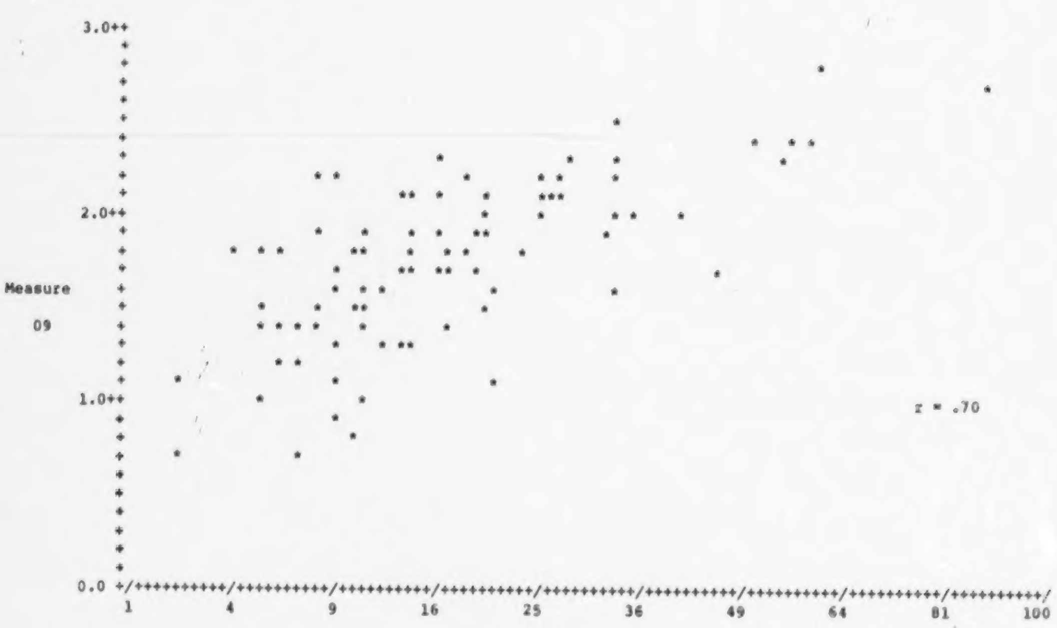

FIGURE 5.2 Mean rating of program effectiveness in educating research scholars/scientists (measure 09) versus number of graduates in last five years (measure 02)--91 programs in geosciences.

TABLE 5.4 Characteristics of Survey Participants in Geosciences

	Respondents	
	N	%
Field of Specialization		
Geochemistry	18	10
Geology	66	37
Geophysics	29	16
Mineralogy/Petrology	31	18
Paleontology	13	7
Other/Unknown	20	11
Faculty Rank		
Professor	115	65
Associate Professor	36	20
Assistant Professor	21	12
Other/Unknown	5	3
Year of Highest Degree		
Pre-1950	8	5
1950-59	51	29
1960-69	70	40
Post-1969	48	27
Evaluator Selection		
Nominated by Institution	154	87
Other	23	13
Survey Form		
With Faculty Names	157	89
Without Names	20	11
Total Evaluators	177	100

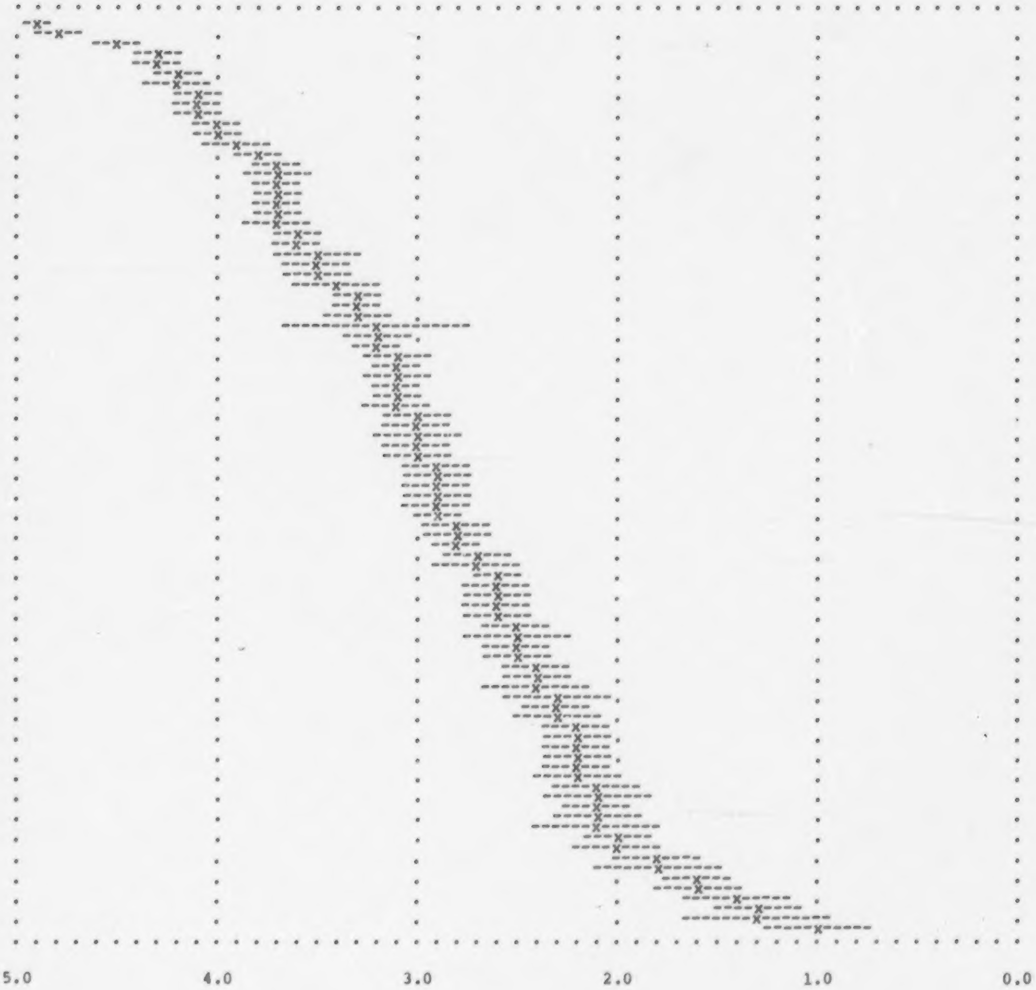

FIGURE 5.3 Mean rating of scholarly quality of faculty in 91 programs in geosciences.

NOTE: Programs are listed in sequence of mean rating, with the highest-rated program appearing at the top of the page. The broken lines (---) indicate a confidence interval of ±1.5 standard errors around the reported mean (x) of each program.

VI
Mathematics Programs

In this chapter 115 research-doctorate programs in mathematics are assessed. These programs, according to the information supplied by their universities, have accounted for 2,731 doctoral degrees awarded during the FY1976-80 period--approximately 92 percent of the aggregate number of mathematics doctorates earned from U.S. universities in this five-year span.[1] On the average, 35 full-time and part-time students intending to earn doctorates were enrolled in a program in December 1980, with an average faculty size of 33 members.[2] The 115 programs, listed in Table 6.1, represent 114 different universities--two programs are included from the University of Maryland (College Park). All but six of the programs were initiated prior to 1970. In addition to the 114 universities represented in this discipline, another 3 were initially identified as meeting the criteria[3] for inclusion in the assessment:

Idaho State University
Lehigh University
University of Northern Colorado

Mathematics programs at these three institutions have not been included in the evaluations in this discipline, since in each case the study coordinator either indicated that the institution did not at that time have a research-doctorate program in mathematics or failed to provide the information requested by the committee.

Before examining the individual program results presented in Table 6.1, the reader is urged to refer to Chapter II, in which each of the 16 measures used in the assessment is discussed. Summary statistics describing every measure are given in Table 6.2. For 10 of the measures, data are reported for at least 108 of the 115 mathematics programs. For measures 04-07, which pertain to characteristics of the program graduates, data are presented for 95 (or more) of the programs; the other 20 programs had too few graduates on which to base statistics.[4] For measure 12, a composite index of the size of a university library, data are available for 82 programs; for measure 14, total university expenditures for research in this discipline, data are available for 83 programs. With respect to the latter measure, it should be noted that reported data include expenditures for research in statistics as well as in mathematics. The programs not evaluated on measures 12 and 14 are typically smaller--in terms of faculty size and graduate student enrollment--than other mathematics programs. Were data on measures 12 and 14 available for all 91 programs, it is likely that the reported means for these measures would be appreciably lower (and that some of the correlations of these measures with others would be higher).

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[1] Data from the NRC's Survey of Earned Doctorates indicate that 2,958 research doctorates in mathematics were awarded by U.S. universities between FY1976 and FY1980.

[2] See the reported means for measures 03 and 01 in Table 6.2.

[3] As mentioned in Chapter I, the primary criterion for inclusion was that a university had awarded at least 7 doctorates in mathematics during the FY1976-78 period.

Intercorrelations among the 16 measures (Pearson product-moment coefficients) are given in Table 6.3. Of particular note are the high positive correlations of the measures of the numbers of doctoral graduates and students (02, 03) with measures of publication records (15, 16) and reputational survey ratings (08, 09, and 11). Figure 6.1 illustrates the relation between the mean rating of the scholarly quality of faculty (measure 08) and the number of faculty members (measure 01) for each of the 114 mathematics programs. Figure 6.2 plots the mean rating of program effectiveness (measure 09) against the total number of FY1976-80 program graduates (measure 02). Although in both figures there is a significant positive correlation between program size and reputational rating, it is quite apparent that some of the smaller programs received high mean ratings and some of the larger programs received low mean ratings.

Table 6.4 describes the 223 faculty members who participated in the evaluation of mathematics programs. These individuals constituted 64 percent of those asked to respond to the survey in this discipline and 6 percent of the faculty population in the 115 research-doctorate programs being evaluated.[5] More than one-third of the survey participants were in the specialty area of analysis/functional analysis, and almost two-thirds were full professors. More than two-thirds had earned their highest degree prior to 1970.

Several exceptions should be noted with regard to the survey evaluations in this discipline. In the initial survey mailing the list of faculty in the Brown University program included only applied mathematicians. At the request of the study coordinator at this institution and a member of the study committee, the names of another 24 mathematics faculty members were added to the list, and revised survey forms that included the Brown program along with 11 other (randomly selected) mathematics programs were sent to 178 evaluators in this discipline.[6] The responses to the second survey were used to compute mean ratings for the Brown program. Another problem with the survey evaluations in mathematics involved the mislabeling of the location of an institution. In the program listing on the survey form, New Mexico State University at Las Cruces was identified as being located in Alamogordo, which has a junior college branch of the same institution. Since a large majority of faculty evaluators indicated that they were unfamiliar with this program and it is quite possible that some of them were misled by the inaccurate identification of this institution, the committee has decided not to report the survey results for this program. Two other instances of mislabeling were called to the attention of the committee. The program at the Courant Institute was identified as "New York University--Mathematics," and the Wesleyan University program in the Department of Mathematics was called "Physical Sciences." The committee has decided in both instances to report the survey results but cautions that the reputational ratings may have been influenced by the use of inaccurate program titles on the survey form.

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[4] As mentioned in Chapter II, data for measures 04-07 are not reported if they are based on the survey responses of fewer than 10 FY1975-79 program graduates.

[5] See Table 2.3 in Chapter II.

To assist the reader in interpreting results of the survey evaluations, estimated standard errors have been computed for mean ratings of the scholarly quality of faculty in 114 mathematics programs (and are given in Table 6.1). For each program the mean rating and an associated "confidence interval" of 1.5 standard errors are illustrated in Figure 6.3 (listed in order of highest to lowest mean rating). In comparing two programs, if their confidence intervals do not overlap, one may conclude that there is a significant difference in their mean ratings at a .05 level of significance.[7] From this figure it is also apparent that one should have somewhat more confidence in the accuracy of the mean ratings of higher-rated programs than lower-rated programs. This generalization results primarily from the fact that evaluators are not as likely to be familiar with the less prestigious programs, and consequently the mean ratings of these programs are usually based on fewer survey responses.

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[6] See Chapter IX for a comparison of the "resurvey" results with the original survey ratings for these 11 other mathematics programs.

[7] See pp. 29-31 for a discussion of the interpretation of mean ratings and associated confidence intervals.

TABLE 6.1 Program Measures (Raw and Standardized Values) in Mathematics

Prog No.	University - Department/Academic Unit	Program Size			Characteristics of Program Graduates			
		(01)	(02)	(03)	(04)	(05)	(06)	(07)
001.	Adelphi University	14	9	37	.29	8.5	.79	.07
	Mathematics and Computer Science	*39*	*43*	*51*	*52*	*34*	*61*	*38*
002.	Alabama, University of-Tuscaloosa	19	19	4	.25	7.8	.53	.13
	Mathematics	*42*	*48*	*40*	*50*	*40*	*45*	*42*
003.	Arizona, University of-Tucson	46	14	14	.17	5.5	.75	.33
	Mathematics	*58*	*46*	*43*	*44*	*59*	*58*	*56*
004.	Auburn University	34	13	26	.15	7.0	.69	.31
	Mathematics	*51*	*45*	*47*	*43*	*46*	*55*	*54*
005.	Boston University	17	9	25	.08	7.5	.73	.27
	Mathematics	*40*	*43*	*47*	*38*	*42*	*57*	*52*
006.	Bowling Green State University	25	11	13	NA	NA	NA	NA
	*Mathematics and Statistics**	*45*	*44*	*43*				
007.	Brandeis University	12	21	29	.14	5.5	.80	.40
	Mathematics	*37*	*49*	*48*	*42*	*59*	*61*	*60*
008.	Brown University	43	80	78	.11	6.2	.63	.26
	Mathematics and Applied Mathematics	*56*	*75*	*64*	*40*	*53*	*51*	*51*
009.	CUNY-Graduate School	26	33	57	.06	7.0	.42	.10
	Mathematics	*46*	*54*	*57*	*37*	*46*	*38*	*39*
010.	California Institute of Technology	20	13	17	.25	4.2	.70	.45
	Mathematics	*42*	*45*	*44*	*50*	*70*	*55*	*64*
011.	California, University of-Berkeley	72	160	209	.30	5.7	.72	.45
	Mathematics	*74*	*99*	*99*	*53*	*57*	*56*	*63*
012.	California, University of-Davis	32	16	12	.09	6.1	.40	.10
	Mathematics	*49*	*47*	*43*	*39*	*54*	*37*	*40*
013.	California, University of-Los Angeles	85	50	115	.15	6.1	.71	.37
	Mathematics/Biomathematics	*82*	*62*	*76*	*43*	*54*	*56*	*58*
014.	California, University of-Riverside	16	21	23	.17	5.4	.47	.18
	Mathematics	*40*	*49*	*46*	*44*	*60*	*42*	*45*
015.	California, University of-San Diego	42	31	41	.14	5.8	.71	.49
	Mathematics	*56*	*53*	*52*	*42*	*57*	*56*	*66*
016.	California, University of-Santa Barbara	35	26	56	.00	5.0	.43	.21
	Mathematics	*51*	*51*	*57*	*32*	*63*	*39*	*47*
017.	Carnegie-Mellon University	22	24	40	.35	7.5	.74	.33
	Mathematics	*43*	*50*	*52*	*57*	*42*	*58*	*56*
018.	Case Western Reserve University	23	16	10	.25	6.2	NA	NA
	Mathematics and Statistics	*44*	*47*	*42*	*50*	*53*		
019.	Chicago, University of	30	60	77	.30	4.8	.91	.63
	Mathematics	*48*	*66*	*64*	*53*	*65*	*68*	*76*
020.	Cincinnati, University of	30	12	15	.18	7.0	.36	.18
	Mathematics	*48*	*45*	*44*	*45*	*46*	*35*	*45*

* indicates program was initiated since 1970.

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TABLE 6.1 Program Measures (Raw and Standardized Values) in Mathematics

Prog	Survey Results				University Library	Research Support		Published Articles		Survey Ratings Standard Error			
No.	(08)	(09)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(08)	(09)	(10)	(11)
001.	0.9	0.7	NA	0.2	NA	.00	NA	0		.20	.17	NA	.04
	33	*35*		*35*		*31*		*37*	*41*				
002.	1.1	0.4	1.1	0.2	-1.3	.05	NA	12		.13	.10	.10	.05
	34	*30*	*45*	*36*	*36*	*34*		*41*	*42*				
003.	2.6	1.6	1.3	0.7	0.9	.28	294	30		.12	.11	.10	.07
	50	*50*	*58*	*49*	*58*	*48*	*46*	*47*	*44*				
004.	1.9	1.1	1.1	0.4	NA	.18	NA	23		.15	.13	.09	.06
	42	*42*	*47*	*41*		*42*		*45*	*45*				
005.	1.7	0.8	1.2	0.3	-0.4	.18	151	6		.13	.13	.15	.05
	40	*36*	*52*	*38*	*46*	*42*	*44*	*39*	*41*				
006.	1.3	0.6	NA	0.3	NA	.16	NA	15		.15	.14	NA	.06
	37	*34*		*39*		*41*		*42*	*44*				
007.	3.8	2.1	0.8	1.1	NA	.50	209	43		.07	.06	.08	.08
	61	*59*	*31*	*59*		*61*	*45*	*51*	*53*				
008.	4.1	2.4	1.3	1.4	-1.1	.58	1214	43		.06	.06	.06	.06
	64	*64*	*57*	*66*	*39*	*66*	*58*	*51*	*54*				
009.	3.5	1.9	0.9	1.0	NA	.54	199	98		.08	.09	.07	.07
	59	*56*	*38*	*56*		*63*	*45*	*70*	*58*				
010.	3.8	2.2	1.1	1.3	NA	.45	212	47		.08	.07	.07	.06
	62	*62*	*46*	*63*		*58*	*45*	*53*	*51*				
011.	4.9	2.7	1.2	1.6	2.2	.39	1292	141		.03	.05	.05	.06
	72	*71*	*50*	*71*	*71*	*54*	*59*	*84*	*91*				
012.	2.3	1.4	1.1	0.4	0.6	.16	NA	22		.15	.14	.13	.06
	46	*48*	*45*	*41*	*55*	*41*		*44*	*44*				
013.	4.0	2.3	1.3	1.3	2.0	.44	472	80		.06	.06	.06	.07
	63	*64*	*59*	*64*	*68*	*57*	*48*	*64*	*65*				
014.	2.3	1.6	1.0	0.5	-1.0	.25	259	19		.14	.13	.08	.07
	47	*50*	*44*	*44*	*40*	*46*	*45*	*43*	*43*				
015.	3.4	2.0	1.4	1.1	-0.0	.48	424	56		.08	.06	.08	.07
	57	*58*	*66*	*60*	*49*	*59*	*48*	*56*	*61*				
016.	2.7	1.7	1.0	0.7	-0.1	.31	352	57		.11	.10	.10	.07
	50	*52*	*44*	*49*	*48*	*50*	*47*	*56*	*53*				
017.	3.0	1.9	1.0	0.6	NA	.59	664	35		.14	.11	.09	.07
	53	*57*	*44*	*45*		*66*	*51*	*49*	*45*				
018.	2.6	1.5	1.1	0.8	-1.3	.17	NA	20		.10	.10	.10	.07
	50	*50*	*49*	*51*	*36*	*42*		*44*	*47*				
019.	4.8	2.7	1.0	1.5	0.9	.60	1119	69		.04	.05	.06	.05
	71	*70*	*42*	*68*	*58*	*67*	*56*	*60*	*58*				
020.	1.9	1.2	1.3	0.5	-0.2	.20	NA	28		.12	.12	.11	.06
	42	*44*	*58*	*43*	*47*	*43*		*46*	*44*				

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TABLE 6.1 Program Measures (Raw and Standardized Values) in Mathematics

Prog		Program Size			Characteristics of Program Graduates			
No.	University - Department/Academic Unit	(01)	(02)	(03)	(04)	(05)	(06)	(07)
021.	Claremont Graduate School	15	6	11	.70	NA	.20	.00
	Mathematics	*39*	*42*	*42*	*81*		*25*	*33*
022.	Clarkson College of Technology	17	4	16	NA	NA	NA	NA
	Mathematics and Computer Science	*40*	*41*	*44*				
023.	Clemson University	28	12	19	NA	NA	NA	NA
	Mathematical Sciences	*47*	*45*	*45*				
024.	Colorado State University-Fort Collins	30	11	23	.10	5.5	NA	NA
	Mathematics	*48*	*44*	*46*	*39*	*59*		
025.	Colorado, University of	44	34	45	.17	7.0	.63	.30
	Mathematics	*57*	*55*	*53*	*44*	*46*	*51*	*53*
026.	Columbia University	19	30	46	.18	6.3	.56	.37
	Mathematics	*42*	*53*	*54*	*45*	*52*	*47*	*58*
027.	Connecticut, University of-Storrs	23	6	12	NA	NA	NA	NA
	Mathematics	*44*	*42*	*43*				
028.	Cornell University-Ithaca	38	44	39	.27	5.3	.67	.35
	Mathematics	*53*	*59*	*51*	*51*	*61*	*54*	*57*
029.	Dartmouth College	19	16	13	.28	5.3	.71	.29
	Mathematics	*42*	*47*	*43*	*52*	*61*	*56*	*53*
030.	Delaware, University of-Newark	32	16	25	.17	9.5	.75	.17
	Mathematical Sciences	*49*	*47*	*47*	*44*	*25*	*58*	*44*
031.	Denver, University of	16	8	8	NA	NA	NA	NA
	Mathematics and Computer Science	*40*	*43*	*42*				
032.	Duke University	21	16	21	.57	5.8	.50	.21
	Mathematics	*43*	*47*	*46*	*72*	*57*	*43*	*47*
033.	Emory University	17	13	8	.50	6.5	.50	.08
	Mathematics	*40*	*45*	*42*	*67*	*51*	*43*	*38*
034.	Florida State University-Tallahassee	28	14	16	.25	5.9	.57	.07
	Mathematics	*47*	*46*	*44*	*50*	*56*	*48*	*38*
035.	Florida, University of-Gainesville	34	18	41	.13	6.0	.38	.13
	Mathematics	*51*	*47*	*52*	*41*	*55*	*36*	*41*
036.	Georgia Institute of Technology	41	8	11	.30	7.2	.50	.30
	Mathematics	*55*	*43*	*42*	*53*	*45*	*43*	*53*
037.	Georgia, University of-Athens	23	12	10	.40	7.5	NA	NA
	Mathematics	*44*	*45*	*42*	*60*	*42*		
038.	Harvard University	26	28	48	.72	5.3	.95	.65
	Mathematics	*46*	*52*	*54*	*83*	*61*	*71*	*78*
039.	Houston, University of	25	27	54	.29	7.8	.57	.21
	Mathematics	*45*	*51*	*56*	*53*	*39*	*48*	*47*
040.	Illinois Institute of Technology	6	11	17	.42	10.0	.67	.08
	Mathematics	*34*	*44*	*44*	*62*	*21*	*53*	*38*

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TABLE 6.1 Program Measures (Raw and Standardized Values) in Mathematics

Prog	Survey Results				University Library	Research Support		Published Articles		Survey Ratings Standard Error			
No.	(08)	(09)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(08)	(09)	(10)	(11)
021.	2.3	1.4	1.0	0.6	NA	.40	NA	4		.13	.12	.11	.07
	47	*47*	*40*	*47*		*55*		*38*	*41*				
022.	1.5	0.9	1.1	0.4	NA	.41	152	13		.18	.13	.10	.06
	39	*38*	*47*	*40*		*56*	*44*	*41*	*42*				
023.	1.7	1.1	1.3	0.4	NA	.07	162	16		.13	.16	.12	.06
	40	*43*	*57*	*41*		*35*	*44*	*42*	*43*				
024.	1.9	1.0	1.2	0.4	-1.1	.30	524	22		.15	.09	.12	.06
	42	*40*	*55*	*40*	*38*	*49*	*49*	*44*	*43*				
025.	2.9	1.8	1.2	0.7	-0.9	.39	272	54		.09	.08	.08	.07
	52	*54*	*55*	*49*	*41*	*54*	*46*	*55*	*53*				
026.	4.4	2.3	1.1	1.3	1.7	.53	470	41		.06	.07	.06	.07
	67	*63*	*45*	*64*	*66*	*62*	*48*	*51*	*60*				
027.	2.0	1.0	1.2	0.5	-0.5	.22	138	16		.11	.10	.09	.06
	43	*41*	*52*	*43*	*44*	*44*	*44*	*42*	*43*				
028.	4.0	2.3	1.1	1.4	1.6	.21	528	62		.05	.06	.06	.07
	64	*64*	*47*	*67*	*65*	*44*	*49*	*58*	*63*				
029.	2.6	1.6	0.9	0.7	-1.1	.21	NA	9		.11	.10	.07	.07
	50	*50*	*39*	*49*	*38*	*44*		*40*	*42*				
030.	2.2	1.3	1.5	0.7	NA	.22	186	17		.13	.11	.11	.07
	45	*46*	*71*	*48*		*44*	*45*	*43*	*43*				
031.	1.3	0.7	0.9	0.4	NA	.00	171	3		.16	.11	.08	.06
	37	*35*	*35*	*40*		*31*	*44*	*38*	*41*				
032.	2.8	1.5	1.2	0.8	0.3	.52	114	39		.09	.08	.11	.07
	52	*49*	*53*	*51*	*53*	*62*	*44*	*50*	*47*				
033.	1.5	0.9	0.6	0.3	-0.6	.24	NA	14		.15	.13	.15	.05
	38	*39*	*19*	*38*	*43*	*45*		*42*	*42*				
034.	2.4	1.5	0.8	0.5	-0.4	.21	702	20		.11	.12	.09	.06
	47	*49*	*32*	*44*	*45*	*44*	*51*	*44*	*43*				
035.	2.3	1.4	1.2	0.5	0.8	.12	157	43		.12	.10	.12	.06
	46	*47*	*51*	*44*	*57*	*38*	*44*	*51*	*46*				
036.	2.2	1.3	1.3	0.5	NA	.10	596	39		.12	.11	.11	.06
	45	*46*	*58*	*43*		*37*	*50*	*50*	*47*				
037.	2.3	1.3	1.3	0.6	0.4	.48	607	42		.10	.09	.11	.07
	46	*46*	*59*	*47*	*53*	*60*	*50*	*51*	*50*				
038.	4.8	2.7	1.0	1.6	3.0	.35	789	51		.05	.05	.05	.06
	71	*71*	*42*	*71*	*79*	*52*	*52*	*54*	*65*				
039.	1.9	1.2	1.2	0.4	-0.9	.08	216	24		.13	.11	.10	.06
	42	*44*	*54*	*40*	*41*	*36*	*45*	*45*	*43*				
040.	1.1	0.5	NA	0.3	NA	NA	NA	12		.15	.15	NA	.05
	34	*32*		*38*				*41*	*42*				

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TABLE 6.1 Program Measures (Raw and Standardized Values) in Mathematics

Prog No.	University - Department/Academic Unit	Program Size			Characteristics of Program Graduates			
		(01)	(02)	(03)	(04)	(05)	(06)	(07)
041.	Illinois, University of-Chicago Circle	62	22	54	.32	7.4	.50	.13
	Mathematics	*68*	*49*	*56*	*55*	*43*	*43*	*41*
042.	Illinois, University-Urbana/Champaign	84	79	76	.15	6.7	.74	.42
	Mathematics	*81*	*75*	*63*	*43*	*49*	*58*	*62*
043.	Indiana University-Bloomington	33	21	47	.23	6.4	.77	.43
	Mathematics	*50*	*49*	*54*	*48*	*51*	*59*	*63*
044.	Iowa State University-Ames	42	9	22	NA	NA	NA	NA
	Mathematics	*56*	*43*	*46*				
045.	Iowa, University of-Iowa City	33	24	38	.15	5.9	.35	.12
	Mathematics	*50*	*50*	*51*	*43*	*56*	*34*	*41*
046.	Johns Hopkins University	11	16	21	.07	5.1	.62	.08
	Mathematics	*37*	*47*	*46*	*37*	*62*	*50*	*38*
047.	Kansas, University of	34	12	16	.31	7.4	.31	.23
	Mathematics	*51*	*45*	*44*	*54*	*43*	*32*	*49*
048.	Kent State University	24	18	21	.21	6.4	.87	.27
	*Mathematics**	*45*	*47*	*46*	*47*	*52*	*65*	*51*
049.	Kentucky, University of	37	22	27	.32	7.0	.42	.11
	Mathematics	*52*	*49*	*48*	*54*	*46*	*39*	*40*
050.	Louisiana State University-Baton Rouge	31	14	15	.35	6.4	.47	.24
	Mathematics	*49*	*46*	*44*	*57*	*51*	*42*	*49*
051.	Maryland, University of-College Park	85	3	59	NA	NA	NA	NA
	*Applied Mathematics**	*82*	*41*	*58*				
052.	Maryland, University of-College Park	80	31	65	.23	7.1	.54	.14
	Mathematics	*79*	*53*	*60*	*49*	*45*	*46*	*43*
053.	Massachusetts Institute of Technology	56	116	109	.42	4.8	.67	.42
	Mathematics	*64*	*91*	*74*	*62*	*65*	*53*	*62*
054.	Massachusetts, University of-Amherst	49	19	29	.13	6.0	.44	.26
	Mathematics and Statistics	*60*	*48*	*48*	*42*	*55*	*39*	*51*
055.	Michigan State University-East Lansing	50	25	55	.26	5.8	.65	.32
	Mathematics	*60*	*51*	*56*	*50*	*57*	*52*	*55*
056.	Michigan, University of-Ann Arbor	65	67	89	.32	5.9	.66	.42
	Mathematics	*69*	*69*	*67*	*55*	*56*	*53*	*62*
057.	Minnesota, University of	59	34	92	.39	5.9	.61	.28
	Mathematics	*66*	*55*	*68*	*60*	*56*	*50*	*52*
058.	Missouri, University of-Columbia	23	9	11	.14	6.5	.64	.29
	Mathematics	*44*	*43*	*42*	*42*	*51*	*52*	*52*
059.	Missouri, University of-Rolla	13	11	4	NA	NA	NA	NA
	Mathematics	*38*	*44*	*40*				
060.	Montana, University of-Missoula	19	11	12	NA	NA	NA	NA
	Mathematics	*42*	*44*	*43*				

* indicates program was initiated since 1970.

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TABLE 6.1 Program Measures (Raw and Standardized Values) in Mathematics

Prog No.	Survey Results				University Library	Research Support		Published Articles		Survey Ratings Standard Error			
	(08)	(09)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(08)	(09)	(10)	(11)
041.	3.0	1.7	1.5	1.0	NA	.32	883	49		.08	.07	.08	.07
	54	*52*	*71*	*56*		*50*	*53*	*53*	*53*				
042.	4.0	2.3	1.1	1.3	2.0	.37	773	135		.06	.06	.06	.06
	63	*63*	*47*	*65*	*68*	*53*	*52*	*82*	*72*				
043.	3.5	2.0	1.2	1.2	0.9	.55	344	40		.07	.04	.09	.06
	58	*58*	*51*	*62*	*58*	*64*	*47*	*50*	*52*				
044.	2.1	1.2	1.0	0.5	-0.5	.07	2140	36		.13	.11	.08	.07
	45	*44*	*39*	*43*	*44*	*35*	*69*	*49*	*44*				
045.	2.2	1.5	1.1	0.5	0.3	.36	NA	43		.12	.11	.07	.07
	46	*49*	*50*	*43*	*52*	*53*		*51*	*50*				
046.	3.4	1.7	0.8	0.8	-0.4	.64	184	35		.12	.09	.08	.07
	57	*53*	*29*	*51*	*45*	*69*	*44*	*49*	*56*				
047.	2.3	1.3	0.9	0.5	0.1	.24	109	44		.10	.10	.11	.06
	46	*46*	*39*	*44*	*50*	*45*	*44*	*52*	*49*				
048.	1.8	1.1	1.2	0.5	-1.8	.25	NA	12		.14	.12	.11	.06
	41	*42*	*52*	*42*	*32*	*46*		*41*	*42*				
049.	2.8	1.8	1.6	0.8	-0.1	.49	175	72		.10	.08	.08	.07
	52	*55*	*72*	*52*	*48*	*60*	*44*	*61*	*57*				
050.	2.7	1.6	1.1	0.7	-0.3	.29	709	31		.10	.10	.12	.07
	50	*51*	*45*	*48*	*46*	*48*	*51*	*47*	*45*				
051.	3.5	1.9	1.2	0.7	0.2	.44	382	93		.10	.10	.12	.08
	58	*56*	*52*	*47*	*51*	*57*	*47*	*68*	*70*				
052.	3.5	2.0	1.3	1.2	0.2	.33	382	93		.09	.07	.08	.07
	58	*58*	*60*	*61*	*51*	*51*	*47*	*68*	*70*				
053.	4.9	2.7	1.1	1.6	-0.3	.41	1289	126		.03	.06	.05	.05
	72	*70*	*50*	*71*	*46*	*56*	*59*	*79*	*84*				
054.	2.7	1.7	1.3	0.8	-0.7	.31	158	36		.10	.08	.08	.06
	50	*52*	*58*	*51*	*42*	*49*	*44*	*49*	*48*				
055.	2.7	1.7	1.2	0.9	0.3	.16	298	51		.09	.07	.07	.06
	50	*52*	*51*	*54*	*53*	*41*	*46*	*54*	*49*				
056.	4.1	2.4	1.2	1.5	1.8	.29	844	75		.07	.07	.06	.06
	64	*65*	*50*	*70*	*67*	*49*	*53*	*62*	*58*				
057.	3.9	2.2	1.2	1.2	1.2	.53	1207	73		.07	.07	.06	.07
	62	*62*	*54*	*62*	*61*	*62*	*58*	*62*	*60*				
058.	1.7	0.9	1.0	0.5	-0.2	.04	NA	24		.11	.11	.12	.06
	41	*39*	*40*	*43*	*47*	*34*		*45*	*45*				
059.	1.1	0.9	0.9	0.3	NA	.15	NA	22		.11	.14	.07	.06
	35	*38*	*36*	*39*		*40*		*44*	*43*				
060.	1.2	0.6	1.1	0.3	NA	.26	NA	0		.12	.12	.07	.05
	35	*34*	*48*	*38*		*47*		*37*	*41*				

NOTE: On the first line of data for every program, raw values for each measure are reported; on the second line values are reported in standardized form, with mean = 50 and standard deviation = 10. "NA" indicates that the value for a measure is not available. Since the scale used to compute measure (16) is entirely arbitrary, only values in standardized form are reported for this measure.

TABLE 6.1 Program Measures (Raw and Standardized Values) in Mathematics

Prog No.	University - Department/Academic Unit	Program Size (01)	(02)	(03)	Characteristics of Program Graduates (04)	(05)	(06)	(07)
061.	Nebraska, University of-Lincoln	34	16	16	.31	9.3	.75	.50
	Mathematics and Statistics	*51*	*47*	*44*	*54*	*27*	*58*	*67*
062.	New Mexico State University-Las Cruces	30	6	15	.50	8.0	.64	.18
	Mathematical Sciences	*48*	*42*	*44*	*67*	*38*	*52*	*45*
063.	New Mexico, University of-Albuquerque	29	11	25	.30	7.5	.90	.20
	Mathematics and Statistics	*48*	*44*	*47*	*53*	*42*	*67*	*47*
064.	New York University	37	70	91	.25	6.5	.77	.29
	Mathematics (Courant Institute)	*52*	*71*	*68*	*50*	*51*	*60*	*52*
065.	North Carolina State University-Raleigh	52	13	12	.13	7.0	.13	.07
	Mathematics	*62*	*45*	*43*	*42*	*46*	*21*	*37*
066.	North Carolina, University of-Chapel Hill	29	13	21	.50	5.8	.63	.19
	Mathematics	*48*	*45*	*46*	*67*	*56*	*51*	*46*
067.	Northeastern University	38	12	28	NA	NA	NA	NA
	Mathematics	*53*	*45*	*48*				
068.	Northwestern University	39	29	31	.38	6.0	.62	.27
	Mathematics	*54*	*52*	*49*	*59*	*55*	*50*	*51*
069.	Notre Dame, University of	19	28	36	.19	5.8	.62	.43
	Mathematics	*42*	*52*	*50*	*46*	*57*	*51*	*62*
070.	Ohio State University-Columbus	55	45	97	.17	6.8	.50	.25
	Mathematics	*63*	*60*	*70*	*44*	*48*	*43*	*50*
071.	Ohio University-Athens	25	8	39	NA	NA	NA	NA
	*Mathematics**	*45*	*43*	*51*				
072.	Oklahoma State University-Stillwater	26	10	16	NA	NA	NA	NA
	Mathematics	*46*	*44*	*44*				
073.	Oklahoma, University of-Norman	26	17	10	.21	8.2	.29	.14
	Mathematics	*46*	*47*	*42*	*47*	*36*	*30*	*43*
074.	Oregon State University-Corvallis	32	19	15	.11	9.8	.50	.22
	Mathematics	*49*	*48*	*44*	*40*	*23*	*43*	*48*
075.	Oregon, University of-Eugene	30	22	38	.35	7.3	.60	.30
	Mathematics	*48*	*49*	*51*	*57*	*44*	*49*	*53*
076.	Pennsylvania State University	45	23	42	.14	8.0	.64	.18
	Mathematics	*57*	*50*	*52*	*42*	*38*	*52*	*45*
077.	Pennsylvania, University of	31	23	24	.25	5.8	.60	.35
	Mathematics	*49*	*50*	*47*	*50*	*56*	*49*	*57*
078.	Pittsburgh, University of	34	11	37	.27	7.5	.82	.18
	Mathematics and Statistics	*51*	*44*	*51*	*51*	*42*	*63*	*45*
079.	Polytech Institute of New York	13	17	20	.17	8.6	.46	.04
	Mathematics	*38*	*47*	*45*	*44*	*33*	*41*	*36*
080.	Princeton University	25	63	49	.62	4.5	.89	.63
	Mathematics	*45*	*68*	*55*	*76*	*68*	*67*	*76*

* indicates program was initiated since 1970.

NOTE: On the first line of data for every program, raw values for each measure are reported; on the second line values are reported in standardized form, with mean = 50 and standard deviation = 10. "NA" indicates that the value for a measure is not available.

TABLE 6.1 Program Measures (Raw and Standardized Values) in Mathematics

Prog	Survey Results				University Library	Research Support		Published Articles		Survey Ratings Standard Error			
No.	(08)	(09)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(08)	(09)	(10)	(11)
061.	1.8	1.0	1.1	0.4	-0.5	.18	NA	23		.11	.10	.08	.05
	42	*41*	*48*	*40*	*44*	*42*		*45*	*43*				
062.	NA	NA	NA	NA	NA	.13	1049	16		NA	NA	NA	NA
						39	*56*	*42*	*45*				
063.	2.1	1.3	1.0	0.6	-1.0	.17	110	23		.15	.12	.09	.07
	45	*45*	*40*	*47*	*40*	*41*	*44*	*45*	*43*				
064.	4.5	2.6	0.9	1.4	0.5	.43	3788	67		.07	.06	.07	.07
	69	*68*	*34*	*66*	*54*	*57*	*90*	*59*	*70*				
065.	2.1	1.2	1.3	0.4	NA	.15	637	64		.11	.12	.10	.05
	44	*44*	*58*	*41*		*40*	*50*	*58*	*46*				
066.	3.0	1.7	1.3	1.0	1.0	.48	4356	25		.08	.08	.09	.07
	53	*53*	*56*	*56*	*59*	*60*	*98*	*45*	*47*				
067.	2.5	1.4	1.4	0.6	NA	.26	114	15		.12	.12	.11	.06
	48	*48*	*64*	*45*		*47*	*44*	*42*	*45*				
068.	3.5	2.0	1.2	1.2	0.3	.77	367	74		.06	.05	.06	.07
	58	*57*	*51*	*61*	*52*	*77*	*47*	*62*	*55*				
069.	2.7	1.7	1.0	0.7	-1.3	.42	154	23		.11	.08	.10	.06
	51	*53*	*42*	*49*	*36*	*56*	*44*	*45*	*44*				
070.	3.0	1.8	1.2	1.0	0.9	.36	662	76		.09	.08	.10	.07
	53	*55*	*53*	*56*	*58*	*53*	*51*	*63*	*53*				
071.	1.3	0.6	1.1	0.3	NA	.00	152	15		.14	.12	.05	.06
	37	*33*	*45*	*39*		*31*	*44*	*42*	*42*				
072.	1.7	1.0	1.2	0.5	-1.9	.23	NA	12		.13	.13	.10	.07
	40	*41*	*50*	*43*	*30*	*45*		*41*	*44*				
073.	2.0	1.2	1.2	0.5	-0.6	.39	NA	28		.14	.12	.12	.06
	44	*44*	*52*	*42*	*44*	*54*		*46*	*46*				
074.	2.4	1.5	1.2	0.6	NA	.31	345	15		.10	.11	.10	.07
	47	*48*	*54*	*46*		*50*	*47*	*42*	*43*				
075.	2.9	1.8	1.1	0.7	-0.9	.27	125	29		.10	.11	.06	.07
	53	*54*	*48*	*50*	*40*	*47*	*44*	*47*	*45*				
076.	3.0	1.8	1.4	1.0	0.7	.42	254	82		.09	.07	.07	.08
	53	*55*	*64*	*56*	*56*	*56*	*45*	*65*	*57*				
077.	3.7	2.1	0.9	1.1	0.7	.42	480	30		.07	.06	.06	.07
	60	*59*	*39*	*59*	*56*	*56*	*48*	*47*	*53*				
078.	2.5	1.7	1.2	0.6	0.1	.29	1113	34		.09	.08	.08	.06
	48	*52*	*52*	*45*	*50*	*49*	*56*	*48*	*46*				
079.	2.1	1.2	NA	0.4	NA	.15	NA	25		.16	.26	NA	.05
	44	*44*		*40*		*40*		*45*	*44*				
080.	4.9	2.8	1.1	1.6	0.9	.60	1389	91		.03	.04	.03	.05
	73	*73*	*45*	*73*	*58*	*67*	*60*	*68*	*78*				

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TABLE 6.1 Program Measures (Raw and Standardized Values) in Mathematics

Prog No.	University - Department/Academic Unit	Program Size (01)	(02)	(03)	Characteristics of Program Graduates (04)	(05)	(06)	(07)
081.	Purdue University-West Lafayette	57	28	30	.19	6.4	.56	.28
	Mathematics	*65*	*52*	*49*	*46*	*52*	*47*	*52*
082.	Rensselaer Polytechnic Institute	29	18	20	.29	5.3	.88	.50
	Mathematical Sciences	*48*	*47*	*45*	*53*	*61*	*66*	*67*
083.	Rice University	14	9	11	.25	4.9	.42	.17
	Mathematics	*39*	*43*	*42*	*50*	*64*	*38*	*44*
084.	Rochester, University of	26	23	26	.29	6.9	.67	.05
	Mathematics	*46*	*50*	*47*	*52*	*47*	*53*	*36*
085.	Rutgers, The State University-New Brunswick	65	57	85	.15	5.4	.55	.33
	Mathematics	*69*	*65*	*66*	*43*	*60*	*46*	*56*
086.	SUNY at Albany	28	6	47	NA	NA	NA	NA
	Mathematics and Statistics	*47*	*42*	*54*				
087.	SUNY at Binghamton	17	9	28	.20	7.5	.80	.20
	Mathematical Sciences	*40*	*43*	*48*	*46*	*42*	*61*	*47*
088.	SUNY at Buffalo	36	29	45	.17	6.9	.59	.31
	Mathematics	*52*	*52*	*53*	*44*	*47*	*49*	*54*
089.	SUNY at Stony Brook	31	35	60	.18	5.5	.61	.39
	Mathematics	*49*	*55*	*58*	*45*	*59*	*50*	*59*
090.	Saint Louis University	7	12	29	.00	6.5	.73	.00
	Mathematical Sciences	*34*	*45*	*48*	*32*	*51*	*57*	*33*
091.	South Carolina, University of-Columbia	28	13	13	.14	6.3	.57	.07
	Mathematics and Statistics	*47*	*45*	*43*	*42*	*53*	*48*	*38*
092.	South Florida, University of-Tampa	26	16	11	.00	7.3	.73	.27
	*Mathematics**	*46*	*47*	*42*	*32*	*44*	*57*	*52*
093.	Southern California, University of	29	12	12	NA	NA	NA	NA
	Mathematics	*48*	*45*	*43*				
094.	Southern Illinois University-Carbondale	31	9	10	NA	NA	NA	NA
	Mathematics	*49*	*43*	*42*				
095.	Stanford University	26	48	51	.49	5.4	.82	.57
	Mathematics	*46*	*61*	*55*	*67*	*60*	*62*	*72*
096.	Stevens Institute of Technology	12	19	25	.28	10.2	.75	.19
	Pure and Applied Mathematics	*37*	*48*	*47*	*52*	*19*	*58*	*46*
097.	Syracuse University	28	13	17	.17	6.5	1.00	.33
	Mathematics	*47*	*45*	*44*	*44*	*51*	*73*	*56*
098.	Temple University	35	24	15	.09	7.4	.38	.19
	Mathematics	*51*	*50*	*44*	*39*	*43*	*36*	*46*
099.	Tennessee, University of-Knoxville	28	14	34	.25	7.3	.75	.08
	Mathematics	*47*	*46*	*50*	*50*	*44*	*58*	*38*
100.	Texas Tech University-Lubbock	32	14	11	.07	7.5	.64	.07
	Mathematics	*49*	*46*	*42*	*37*	*42*	*52*	*38*

* indicates program was initiated since 1970.

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TABLE 6.1 Program Measures (Raw and Standardized Values) in Mathematics

Prog	Survey Results				University Library	Research Support		Published Articles		Survey Ratings Standard Error			
No.	(08)	(09)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(08)	(09)	(10)	(11)
081.	3.4	2.1	1.1	1.2	-0.5	.67	167	68		.06	.05	.05	.06
	58	*59*	*49*	*61*	*44*	*71*	*44*	*60*	*67*				
082.	2.7	1.7	1.1	0.6	NA	.48	355	17		.16	.12	.10	.07
	51	*52*	*48*	*45*		*60*	*47*	*43*	*43*				
083.	3.4	2.0	1.1	1.0	-1.4	.57	273	31		.10	.07	.08	.07
	57	*59*	*48*	*56*	*35*	*65*	*46*	*47*	*51*				
084.	2.7	1.7	1.1	0.8	-0.6	.42	194	11		.09	.07	.07	.06
	51	*53*	*45*	*51*	*43*	*56*	*45*	*41*	*42*				
085.	3.6	2.0	1.4	1.3	0.8	.39	1050	84		.07	.05	.08	.06
	59	*59*	*64*	*63*	*57*	*54*	*56*	*65*	*67*				
086.	2.4	1.5	1.2	0.6	-1.0	.39	152	20		.13	.11	.13	.07
	46	*50*	*51*	*47*	*40*	*55*	*44*	*44*	*46*				
087.	1.7	1.1	1.1	0.5	NA	.41	NA	6		.13	.14	.14	.07
	41	*41*	*47*	*44*		*56*		*39*	*41*				
088.	2.7	1.7	1.1	0.9	0.3	.39	356	50		.08	.10	.10	.07
	51	*52*	*46*	*53*	*52*	*54*	*47*	*54*	*48*				
089.	3.7	2.0	1.3	1.1	-0.6	.39	725	40		.08	.07	.08	.07
	61	*59*	*59*	*60*	*43*	*54*	*51*	*50*	*59*				
090.	0.7	0.5	NA	0.2	NA	NA	NA	3		.17	.18	NA	.05
	31	*31*		*36*				*38*	*41*				
091.	1.8	0.9	1.4	0.4	-0.4	.25	211	23		.13	.09	.09	.06
	41	*39*	*61*	*41*	*46*	*46*	*45*	*45*	*45*				
092.	1.5	0.9	1.3	0.5	NA	.08	103	12		.14	.14	.09	.07
	38	*39*	*57*	*43*		*36*	*43*	*41*	*42*				
093.	2.8	1.6	1.1	0.9	0.4	.35	227	47		.10	.10	.09	.07
	52	*51*	*46*	*54*	*53*	*52*	*45*	*53*	*47*				
094.	1.5	0.8	1.2	0.5	-0.2	.10	NA	30		.11	.10	.11	.06
	39	*36*	*50*	*42*	*47*	*37*		*47*	*43*				
095.	4.6	2.6	1.0	1.4	2.0	.54	2697	64		.05	.06	.07	.06
	69	*69*	*44*	*68*	*69*	*63*	*77*	*58*	*69*				
096.	1.2	0.8	NA	0.2	NA	.33	NA	4		.14	.16	NA	.04
	35	*38*		*36*		*51*		*38*	*41*				
097.	2.3	1.4	0.9	0.6	-0.3	.14	NA	22		.10	.13	.06	.06
	47	*47*	*34*	*46*	*46*	*40*		*44*	*44*				
098.	2.4	1.3	1.2	0.6	-0.4	.14	NA	35		.11	.11	.11	.06
	47	*45*	*53*	*45*	*45*	*40*		*49*	*46*				
099.	2.1	1.4	1.3	0.4	-0.4	.25	NA	50		.14	.14	.12	.07
	44	*47*	*60*	*42*	*45*	*46*		*54*	*48*				
100.	1.7	1.0	1.4	0.5	NA	.16	122	23		.13	.13	.11	.06
	40	*40*	*64*	*42*		*41*	*44*	*45*	*43*				

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TABLE 6.1 Program Measures (Raw and Standardized Values) in Mathematics

Prog No.	University - Department/Academic Unit	Program Size			Characteristics of Program Graduates			
		(01)	(02)	(03)	(04)	(05)	(06)	(07)
101.	Texas, University of-Arlington	23	16	23	NA	5.5	NA	NA
	*Mathematics**	*44*	*47*	*46*		*59*		
102.	Texas, University of-Austin	57	20	42	.16	7.3	.52	.13
	Mathematics	*65*	*48*	*52*	*44*	*44*	*45*	*42*
103.	Tulane University	27	17	30	.33	6.0	.60	.25
	Mathematics	*46*	*47*	*49*	*56*	*55*	*49*	*50*
104.	Utah, University of-Salt Lake City	53	24	21	.24	6.7	.79	.54
	Mathematics	*62*	*50*	*46*	*49*	*49*	*61*	*70*
105.	Vanderbilt University	19	16	16	.26	6.4	.72	.28
	Mathematics	*42*	*47*	*44*	*51*	*51*	*57*	*52*
106.	Virginia Polytechnic Institute & State Univ	36	9	25	.20	NA	.80	.20
	Mathematics	*52*	*43*	*47*	*46*		*61*	*47*
107.	Virginia, University of	26	16	31	.50	5.8	.47	.16
	Mathematics	*46*	*47*	*49*	*67*	*57*	*42*	*44*
108.	Washington University-Saint Louis	21	14	32	.32	6.8	.47	.11
	Mathematics	*43*	*46*	*49*	*54*	*49*	*42*	*40*
109.	Washington, University of-Seattle	57	31	27	.23	6.3	.52	.20
	Mathematics	*65*	*53*	*48*	*49*	*53*	*45*	*47*
110.	Wayne State University	46	12	16	.29	7.3	.50	.15
	Mathematics	*58*	*45*	*44*	*52*	*44*	*43*	*43*
111.	Wesleyan University	14	12	7	.17	6.0	.39	.08
	Mathematics	*39*	*45*	*41*	*44*	*55*	*36*	*38*
112.	Western Michigan University	32	9	7	NA	NA	NA	NA
	Mathematics	*49*	*43*	*41*				
113.	Wisconsin, University of-Madison	61	76	174	.23	6.3	.67	.33
	Mathematics	*67*	*73*	*94*	*48*	*52*	*54*	*55*
114.	Wisconsin, University of-Milwaukee	21	17	9	.20	7.0	.45	.10
	Mathematical Sciences	*43*	*47*	*42*	*46*	*46*	*40*	*40*
115.	Yale University	22	43	39	.65	4.9	.42	.27
	Mathematics	*43*	*59*	*51*	*78*	*64*	*38*	*51*

* indicates program was initiated since 1970.

NOTE: On the first line of data for every program, raw values for each measure are reported; on the second line values are reported in standardized form, with mean = 50 and standard deviation = 10. "NA" indicates that the value for a measure is not available.

TABLE 6.1 Program Measures (Raw and Standardized Values) in Mathematics

Prog No.	Survey Results (08)	(09)	(10)	(11)	University Library (12)	Research Support (13)	(14)	Published Articles (15)	(16)	Survey Ratings Standard Error (08)	(09)	(10)	(11)
101.	1.7	0.9	1.4	0.5	NA	.04	NA	0		.14	.11	.10	.07
	40	*39*	*65*	*43*		*34*		*37*	*41*				
102.	3.3	1.8	1.6	1.1	1.6	.58	390	69		.09	.07	.07	.06
	56	*55*	*74*	*58*	*65*	*66*	*47*	*60*	*53*				
103.	2.7	1.7	1.1	0.8	-1.0	.56	172	20		.09	.09	.08	.07
	50	*53*	*45*	*52*	*39*	*64*	*44*	*44*	*44*				
104.	3.2	1.7	1.7	1.1	-0.6	.28	353	39		.10	.10	.07	.07
	55	*53*	*80*	*60*	*43*	*48*	*47*	*50*	*48*				
105.	2.0	1.2	1.1	0.5	-0.7	.11	NA	24		.14	.12	.08	.07
	44	*44*	*50*	*43*	*42*	*38*		*45*	*43*				
106.	2.3	1.4	1.4	0.6	-0.0	.22	490	51		.14	.13	.10	.07
	47	*47*	*64*	*45*	*49*	*44*	*48*	*54*	*49*				
107.	3.0	1.8	0.8	0.8	0.7	.42	148	27		.10	.11	.08	.07
	53	*55*	*30*	*52*	*56*	*56*	*44*	*46*	*45*				
108.	3.1	1.8	1.1	0.9	-0.4	.48	210	22		.09	.09	.10	.07
	55	*55*	*45*	*52*	*45*	*59*	*45*	*44*	*45*				
109.	3.6	2.0	1.3	1.2	1.5	.46	808	42		.07	.07	.07	.07
	59	*59*	*59*	*61*	*63*	*58*	*52*	*51*	*57*				
110.	2.2	1.2	1.2	0.6	-0.4	.24	141	34		.10	.12	.12	.06
	45	*44*	*55*	*46*	*46*	*45*	*44*	*48*	*47*				
111.	1.9	1.1	1.1	0.5	NA	.29	NA	9		.15	.13	.08	.07
	42	*43*	*50*	*42*		*48*		*40*	*42*				
112.	1.1	0.6	1.1	0.3	NA	.06	NA	11		.14	.13	.12	.05
	35	*33*	*47*	*38*		*35*		*41*	*42*				
113.	4.2	2.4	1.1	1.6	1.6	.48	3582	140		.07	.06	.07	.06
	65	*66*	*45*	*72*	*64*	*59*	*88*	*84*	*75*				
114.	1.6	1.0	1.0	0.4	NA	.10	NA	NA		.14	.13	.12	.06
	40	*41*	*42*	*40*		*37*			*NA*				
115.	4.5	2.5	1.1	1.4	2.1	.50	558	58		.06	.07	.06	.06
	69	*67*	*49*	*68*	*70*	*61*	*49*	*56*	*56*				

NOTE: On the first line of data for every program, raw values for each measure are reported; on the second line values are reported in standardized form, with mean = 50 and standard deviation = 10. "NA" indicates that the value for a measure is not available. Since the scale used to compute measure (16) is entirely arbitrary, only values in standardized form are reported for this measure.

TABLE 6.2 Summary Statistics Describing Each Program Measure--Mathematics

Measure	Number of Programs Evaluated	Mean	Standard Deviation	DECILES								
				1	2	3	4	5	6	7	8	9
Program Size												
01 Raw Value	115	33	17	16	19	24	26	29	32	35	43	57
Std Value	115	50	10	40	42	45	46	48	49	51	56	65
02 Raw Value	115	24	22	9	11	12	14	16	19	24	29	47
Std Value	115	50	10	43	44	45	46	47	48	50	52	60
03 Raw Value	115	35	31	11	13	16	21	25	30	39	47	71
Std Value	115	50	10	42	43	44	46	47	49	51	54	62
Program Graduates												
04 Raw Value	98	.25	.14	.10	.14	.17	.19	.23	.26	.29	.32	.43
Std Value	98	50	10	39	42	44	46	49	51	53	55	63
05 Raw Value	97	6.6	1.2	8.0	7.5	7.1	6.8	6.4	6.2	5.9	5.6	5.3
Std Value	97	50	10	38	42	46	48	51	53	56	58	61
06 Raw Value	95	.61	.17	.39	.47	.50	.57	.62	.66	.71	.75	.80
Std Value	95	50	10	37	42	44	48	51	53	55	58	61
07 Raw Value	95	.25	.15	.07	.11	.16	.19	.23	.27	.30	.35	.44
Std Value	95	50	10	38	41	44	46	49	51	53	57	63
Survey Results												
08 Raw Value	114	2.7	1.0	1.4	1.7	2.0	2.3	2.5	2.7	3.0	3.5	4.1
Std Value	114	50	10	38	41	44	47	49	50	53	58	64
09 Raw Value	114	1.6	.6	.8	1.0	1.2	1.4	1.5	1.7	1.8	2.0	2.3
Std Value	114	50	10	37	40	44	47	49	53	54	58	63
10 Raw Value	108	1.2	.2	.9	1.0	1.1	1.1	1.1	1.2	1.2	1.3	1.4
Std Value	108	50	10	36	42	47	47	47	53	53	58	64
11 Raw Value	114	.8	.4	.3	.4	.5	.5	.6	.8	1.0	1.2	1.4
Std Value	114	50	10	38	41	43	43	46	51	56	61	66
University Library												
12 Raw Value	82	.1	1.0	-1.1	-.9	-.5	-.4	-.2	.2	.5	.9	1.6
Std Value	82	50	10	38	40	44	45	47	51	54	58	65
Research Support												
13 Raw Value	113	.32	.17	.09	.16	.21	.25	.30	.38	.42	.48	.54
Std Value	113	50	10	36	41	44	46	49	54	56	59	63
14 Raw Value	83	616	783	139	158	193	255	353	461	610	797	1212
Std Value	83	50	10	44	44	45	45	47	48	50	52	58
Publication Records												
15 Raw Value	114	39	30	10	15	20	24	30	39	46	59	76
Std Value	114	50	10	40	42	44	45	47	50	52	57	63
16 Std Value	114	50	10	42	43	43	45	46	48	52	57	65

NOTE: Standardized values reported in the preceding table have been computed from exact values of the mean and standard deviation and not the rounded values reported here. Since the scale used to compute measure 16 is entirely arbitrary, only data in standardized form are reported for this measure.

TABLE 6.3 Intercorrelations Among Program Measures on 115 Programs in Mathematics

	Measure															
	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16
Program Size																
01		.50	.61	-.13	.10	-.02	.25	.48	.47	.43	.51	.44	.18	.18	.73	.63
02			.85	.08	.31	.18	.46	.70	.68	.01	.72	.45	.35	.41	.75	.81
03				.02	.23	.20	.37	.64	.64	.07	.67	.50	.35	.44	.78	.78
Program Graduates																
04					.14	.07	.21	.30	.30	-.22	.28	.31	.23	.29	.04	.15
05						.05	.41	.57	.56	-.28	.53	.24	.36	.17	.30	.40
06							.57	.19	.19	-.05	.23	.14	.07	.23	.03	.16
07								.63	.61	-.03	.62	.39	.28	.22	.38	.50
Survey Results																
08									.98	-.01	.96	.65	.70	.42	.75	.83
09										-.01	.94	.63	.71	.42	.74	.80
10											.06	.05	.00	-.12	.13	.05
11												.66	.66	.43	.75	.83
University Library																
12													.32	.33	.60	.59
Research Support																
13														.18	.46	.51
14															.35	.42
Publication Records																
15																.90
16																

NOTE: Since in computing correlation coefficients program data must be available for both of the measures being correlated, the actual number of programs on which each coefficient is based varies.

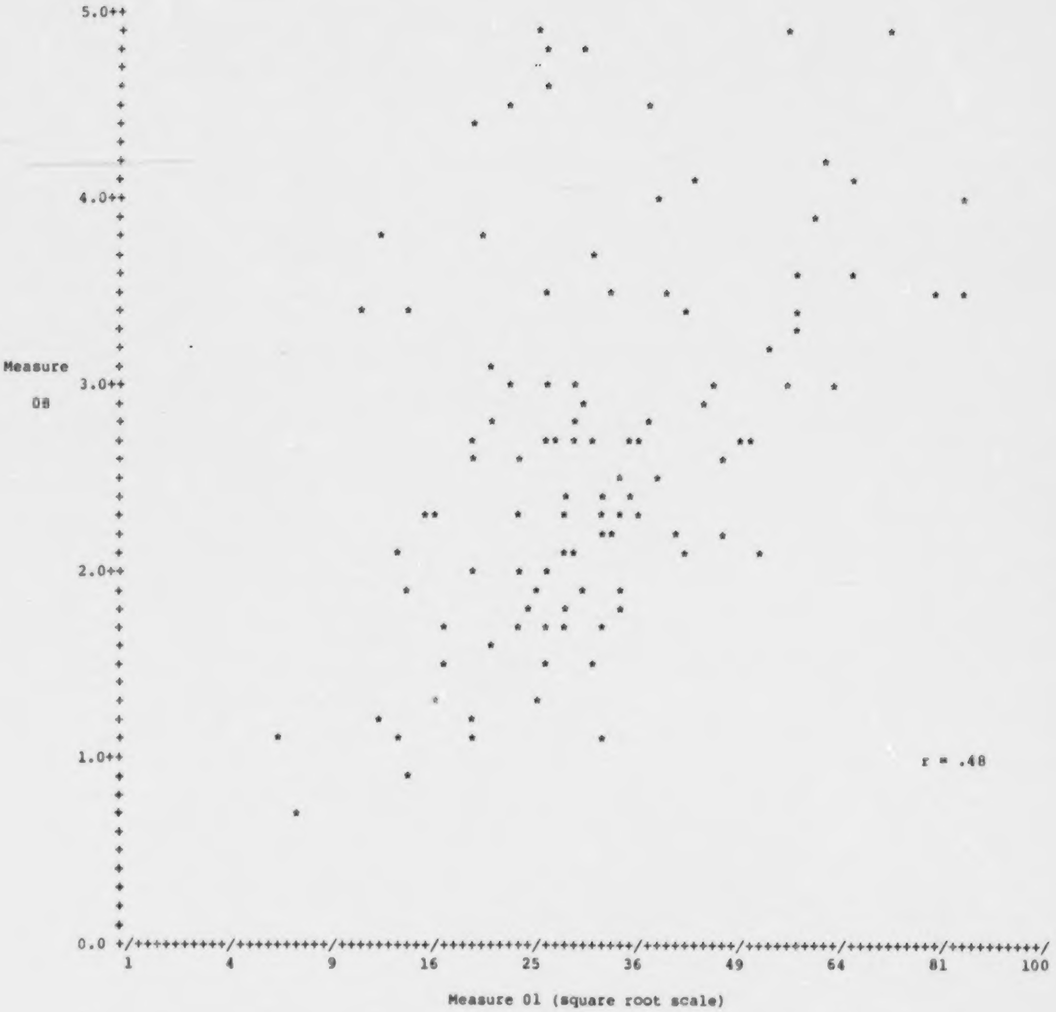

FIGURE 6.1 Mean rating of scholarly quality of faculty (measure 08) versus number of faculty members (measure 01)--114 programs in mathematics.

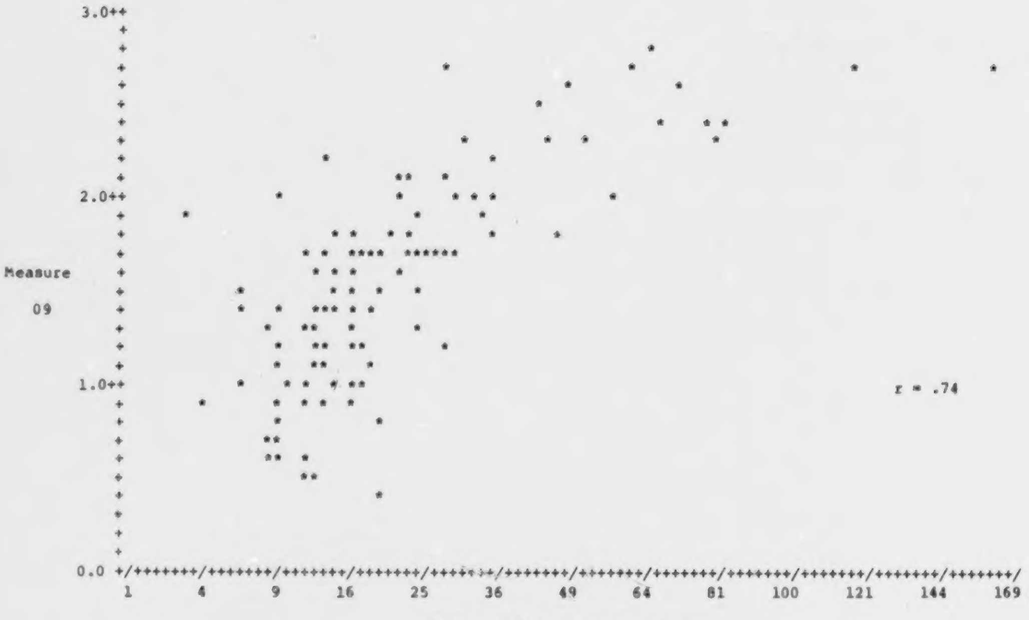

FIGURE 6.2 Mean rating of program effectiveness in educating research scholars/scientists (measure 09) versus number of graduates in last five years (measure 02)--114 programs in mathematics.

TABLE 6.4 Characteristics of Survey Participants in Mathematics

	Respondents	
	N	%
Field of Specialization		
Algebra	25	11
Analysis/Functional Analysis	81	36
Applied Mathematics	31	14
Geometry	12	5
Topology	35	16
Other/Unknown	39	18
Faculty Rank		
Professor	141	63
Associate Professor	66	30
Assistant Professor	16	7
Year of Highest Degree		
Pre-1950	16	7
1950-59	42	19
1960-69	96	43
Post-1969	65	29
Unknown	4	2
Evaluator Selection		
Nominated by Institution	189	85
Other	34	15
Survey Form		
With Faculty Names	198	89
Without Names	25	11
Total Evaluators	223	100

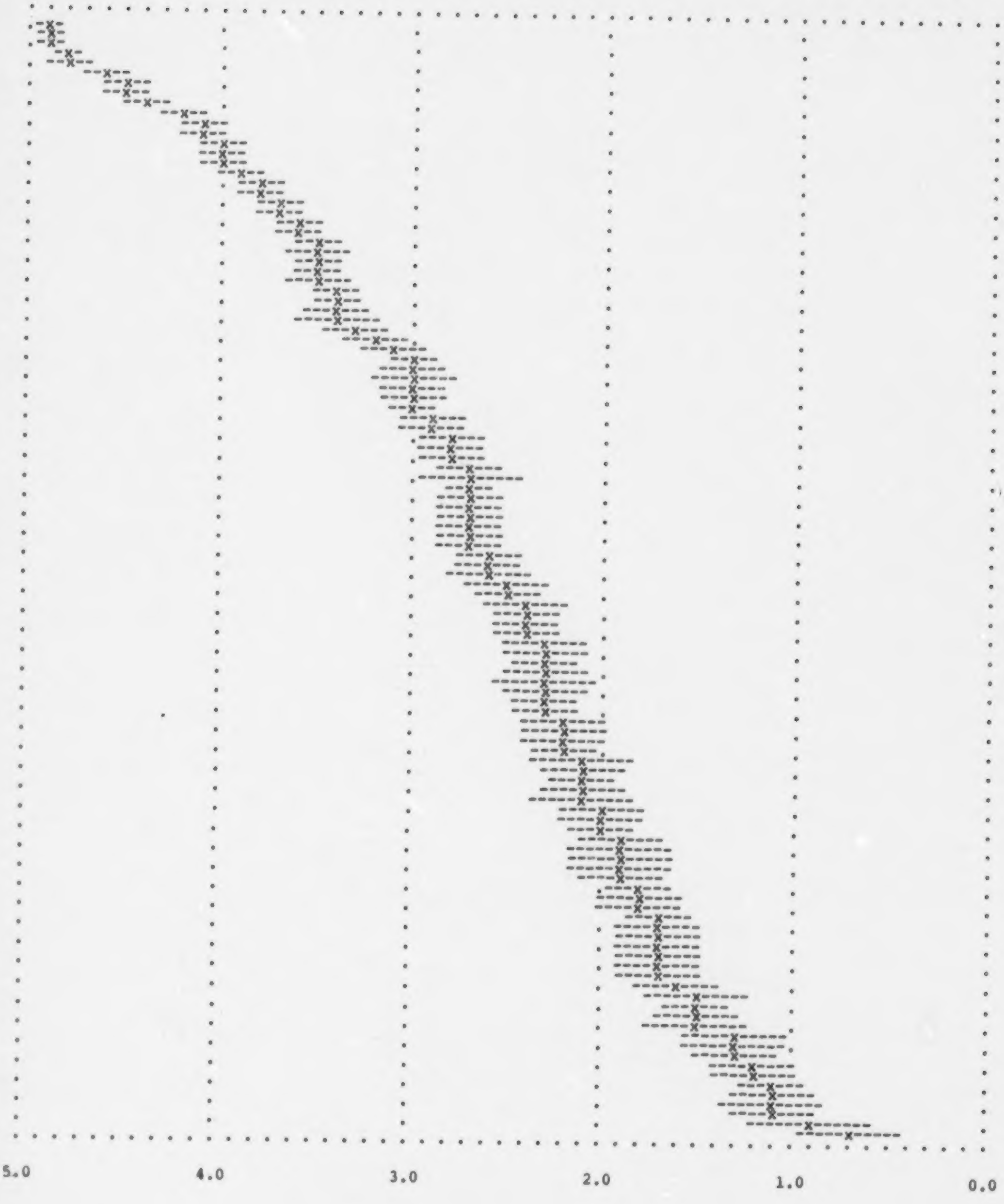

FIGURE 6.3 Mean rating of scholarly quality of faculty in 114 programs in mathematics.

NOTE: Programs are listed in sequence of mean rating, with the highest-rated program appearing at the top of the page. The broken lines (---) indicate a confidence interval of ±1.5 standard errors around the reported mean (x) of each program.

VII
Physics Programs

In this chapter 123 research-doctorate programs in physics are assessed. These programs, according to the information supplied by their universities, have accounted for 4,271 doctoral degrees awarded during the FY1976-80 period--approximately 87 percent of the aggregate number of physics doctorates earned from U.S. universities in this five-year span.[1] On the average, 56 full-time and part-time students intending to earn doctorates were enrolled in a program in December 1980, with an average faculty size of 28 members.[2] The 123 programs, listed in Table 7.1, represent 122 different universities--only Stanford University has two physics programs included in the assessment. All but two of the programs were initiated prior to 1970. In addition to the 122 universities represented in this discipline, only one other institution--Purdue University--was initially identified as meeting the criteria[3] for inclusion in the assessment. Since no information was received (in response to the committee's request) on a physics program at this institution, it has not been included in the evaluations in this discipline.

Before examining the individual program results presented in Table 7.1, the reader is urged to refer to Chapter II, in which each of the 16 measures used in the assessment is discussed. Summary statistics describing every measure are given in Table 7.2. For all but two of the measures, data are reported for at least 109 of the 123 physics programs. For measure 12, a composite index of the size of a university library, data are available for 83 programs; for measure 14, total university expenditures for research in this discipline, data are available for 88 programs. The programs not evaluated on measures 12 and 14 are typically smaller--in terms of faculty size and graduate student enrollment--than other physics programs. Were data on measures 12 and 14 available for all 123 programs, it is likely that the reported means for these two measures would be appreciably lower (and that some of the correlations of these measures with others would be higher).

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[1] Data from the NRC's Survey of Earned Doctorates indicate that 4,889 research doctorates in physics were awarded by U.S. universities between FY1976 and FY1980.

[2] See the reported means for measures 03 and 01 in Table 7.2.

[3] As mentioned in Chapter I, the primary criterion for inclusion was that a university had awarded at least 10 doctorates in physics during the FY1976-78 period.

Intercorrelations among the 16 measures (Pearson product-moment coefficients) are given in Table 7.3. Of particular note are the high positive correlations of the measures of program size (01-03) with measures of publication records (15, 16), research expenditures (14), and reputational survey ratings (08, 09, and 11). Figure 7.1 illustrates the relation between the mean rating of the scholarly quality of faculty (measure 08) and the number of faculty members (measure 01) for each of the 121 physics programs. Figure 7.2 plots the mean rating of program effectiveness (measure 09) against the total number of FY1976-80 program graduates (measure 02). Although in both figures there is a significant positive correlation between program size and reputational rating, it is quite apparent that some of the smaller programs received high mean ratings and some of the larger programs received low mean ratings.

Table 7.4 describes the 211 faculty members who participated in the evaluation of physics programs. These individuals constituted 57 percent of those asked to respond to the survey in this discipline and 6 percent of the faculty population in the 123 research-doctorate programs being evaluated.* A majority of the survey participants specialized in elementary particles or solid state physics, and more than two-thirds held the rank of full professor. Approximately 85 percent had earned their highest degree prior to 1970.

One exception should be noted with regard to the survey evaluations in this discipline. In the program listing on the survey form, New Mexico State University at Las Cruces was identified as being located in Alamogordo, which has a junior college branch of the same institution. Since a large majority of faculty evaluators indicated that they were unfamiliar with this program and it is quite possible that some of them were misled by the inaccurate identification of this institution, the committee has decided not to report the survey results for this program.

To assist the reader in interpreting results of the survey evaluations, estimated standard errors have been computed for mean ratings of the scholarly quality of faculty in 121 physics programs (and are given in Table 7.1). For each program the mean rating and an associated "confidence interval" of 1.5 standard errors are illustrated in Figure 7.3 (listed in order of highest to lowest mean rating). In comparing two programs, if their confidence intervals do not overlap, one may safely conclude that there is a significant difference in their mean ratings at a .05 level of significance.[5] From this figure it is also apparent that one should have somewhat more confidence in the accuracy of the mean ratings of higher-rated programs than lower-rated programs. This generalization results primarily from the fact that evaluators are not as likely to be familiar with the less prestigious programs, and consequently the mean ratings of these programs are usually based on fewer survey responses.

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*See Table 2.3 in Chapter II.

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[5] See pp. 29-31 for a discussion of the interpretation of mean ratings and associated confidence intervals.

TABLE 7.1 Program Measures (Raw and Standardized Values) in Physics

Prog No.	University - Department/Academic Unit	Program Size			Characteristics of Program Graduates			
		(01)	(02)	(03)	(04)	(05)	(06)	(07)
001.	American University	6	17	13	.33	9.8	.71	.00
	Physics	*35*	*45*	*42*	*57*	*25*	*55*	*28*
002.	Arizona State University-Tempe	18	12	22	.31	7.5	.69	.06
	Physics	*43*	*43*	*44*	*55*	*46*	*53*	*33*
003.	Arizona, University of-Tucson	35	25	43	.21	9.0	.58	.29
	Physics	*55*	*47*	*48*	*45*	*32*	*44*	*53*
004.	Auburn University	13	9	27	NA	NA	NA	NA
	Physics	*40*	*42*	*45*				
005.	Boston College	10	15	23	.05	6.5	.47	.26
	Physics	*38*	*44*	*44*	*32*	*56*	*35*	*50*
006.	Boston University	23	10	31	.21	8.5	.31	.15
	Physics	*47*	*42*	*45*	*46*	*36*	*21*	*41*
007.	Brandeis University	20	30	40	.42	7.0	.70	.43
	Physics	*45*	*49*	*47*	*64*	*51*	*54*	*65*
008.	Brown University	31	61	83	.20	7.1	.88	.37
	Physics	*52*	*58*	*55*	*45*	*49*	*69*	*60*
009.	CUNY-Graduate School	51	45	95	.18	8.1	.58	.23
	Physics	*66*	*53*	*57*	*43*	*41*	*44*	*48*
010.	California Institute of Technology	37	69	112	.42	6.2	.69	.31
	Physics, Mathematics, and Astronomy	*56*	*61*	*61*	*64*	*59*	*53*	*54*
011.	California, University of-Santa Cruz	12	15	20	.20	NA	.70	.10
	*Physics**	*39*	*44*	*43*	*45*		*54*	*36*
012.	California, University of-Berkeley	72	179	265	.29	6.5	.77	.36
	Physics	*80*	*94*	*89*	*52*	*56*	*60*	*59*
013.	California, University of-Davis	22	19	38	.35	7.6	.70	.35
	Physics	*46*	*45*	*47*	*58*	*45*	*54*	*58*
014.	California, University of-Irvine	23	41	52	.14	6.1	.58	.19
	Physics	*47*	*52*	*49*	*39*	*59*	*44*	*44*
015.	California, University of-Los Angeles	46	67	183	.28	7.2	.74	.36
	Physics	*63*	*60*	*74*	*52*	*49*	*57*	*59*
016.	California, University of-Riverside	20	29	38	.14	7.3	.64	.29
	Physics	*45*	*48*	*47*	*40*	*48*	*49*	*52*
017.	California, University of-San Diego	38	60	109	.10	7.1	.65	.41
	Physics	*57*	*58*	*60*	*36*	*50*	*50*	*63*
018.	California, University of-Santa Barbara	23	37	50	.36	6.3	.70	.33
	Physics	*47*	*51*	*49*	*58*	*58*	*54*	*56*
019.	Carnegie-Mellon University	30	28	57	.36	6.5	.76	.35
	Physics	*52*	*48*	*50*	*59*	*56*	*59*	*57*
020.	Case Western Reserve University	25	26	32	.37	5.9	.76	.28
	Physics	*48*	*47*	*46*	*60*	*62*	*59*	*52*

* indicates program was initiated since 1970.

NOTE: On the first line of data for every program, raw values for each measure are reported; on the second line values are reported in standardized form, with mean = 50 and standard deviation = 10. "NA" indicates that the value for a measure is not available.

TABLE 7.1 Program Measures (Raw and Standardized Values) in Physics

Prog No.	Survey Results				University Library	Research Support		Published Articles		Survey Ratings Standard Error			
	(08)	(09)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(08)	(09)	(10)	(11)
001.	1.3	1.0	0.9	0.4	NA	NA	NA	9		.14	.14	.07	.06
	37	*36*	*42*	*41*				*40*	*41*				
002.	1.7	1.2	1.2	0.4	-0.3	.33	NA	39		.12	.13	.10	.06
	40	*41*	*54*	*42*	*46*	*48*		*43*	*43*				
003.	3.0	1.8	1.4	0.9	0.9	.46	6187	137		.08	.08	.08	.07
	54	*53*	*61*	*55*	*58*	*56*	*57*	*53*	*50*				
004.	1.2	0.9	NA	0.2	NA	.08	NA	14		.14	.16	NA	.04
	35	*34*		*37*		*32*		*41*	*41*				
005.	1.2	0.6	NA	0.1	NA	.50	609	15		.14	.12	NA	.04
	35	*29*		*36*		*59*	*45*	*41*	*41*				
006.	2.3	1.5	1.2	0.5	-0.4	.44	NA	28		.11	.11	.10	.07
	47	*46*	*55*	*45*	*45*	*55*		*42*	*43*				
007.	3.2	1.9	0.9	0.9	NA	.65	667	54		.08	.05	.07	.07
	55	*55*	*38*	*54*		*69*	*45*	*45*	*45*				
008.	3.5	2.0	1.2	1.0	-1.1	.39	1491	136		.09	.06	.09	.08
	58	*56*	*52*	*55*	*39*	*52*	*47*	*53*	*52*				
009.	3.2	1.8	1.2	0.8	NA	.22	NA	187		.10	.09	.11	.08
	55	*53*	*53*	*53*		*41*		*58*	*58*				
010.	4.9	2.7	1.0	1.6	NA	.35	7760	370		.03	.06	.05	.05
	73	*71*	*43*	*71*		*49*	*61*	*76*	*71*				
011.	2.4	1.6	1.2	0.7	NA	.42	394	19		.12	.09	.10	.07
	47	*48*	*56*	*49*		*54*	*44*	*41*	*42*				
012.	4.9	2.7	0.8	1.6	2.2	.35	1727	323		.04	.06	.06	.05
	72	*70*	*37*	*72*	*70*	*49*	*47*	*71*	*69*				
013.	2.5	1.6	1.1	0.7	0.6	.09	763	57		.10	.08	.08	.07
	48	*49*	*51*	*49*	*55*	*32*	*45*	*45*	*45*				
014.	3.0	1.9	1.1	1.1	NA	.74	2386	115		.08	.05	.05	.06
	54	*54*	*51*	*58*		*75*	*49*	*51*	*51*				
015.	3.8	2.2	1.2	1.3	2.0	.44	5627	269		.07	.05	.05	.06
	62	*60*	*52*	*64*	*68*	*55*	*56*	*66*	*67*				
016.	2.4	1.6	1.1	0.6	-1.0	.45	868	38		.10	.09	.09	.07
	47	*48*	*48*	*47*	*39*	*56*	*45*	*43*	*44*				
017.	4.1	2.2	1.0	1.3	-0.0	.40	11341	136		.08	.06	.07	.06
	65	*61*	*46*	*65*	*49*	*52*	*69*	*53*	*52*				
018.	3.8	2.1	1.7	1.2	-0.1	.61	1619	115		.08	.05	.06	.07
	61	*58*	*76*	*60*	*48*	*66*	*47*	*51*	*51*				
019.	3.5	2.0	0.9	1.0	NA	.40	1992	128		.09	.06	.08	.07
	59	*57*	*42*	*55*		*53*	*48*	*52*	*51*				
020.	2.9	1.8	0.9	0.9	-1.3	.56	1231	79		.09	.07	.07	.07
	53	*53*	*38*	*55*	*36*	*63*	*46*	*47*	*48*				

NOTE: On the first line of data for every program, raw values for each measure are reported; on the second line values are reported in standardized form, with mean = 50 and standard deviation = 10. "NA" indicates that the value for a measure is not available. Since the scale used to compute measure (16) is entirely arbitrary, only values in standardized form are reported for this measure.

TABLE 7.1 Program Measures (Raw and Standardized Values) in Physics

Prog No.	University - Department/Academic Unit	Program Size (01)	Program Size (02)	Program Size (03)	Characteristics of Program Graduates (04)	Characteristics of Program Graduates (05)	Characteristics of Program Graduates (06)	Characteristics of Program Graduates (07)
021.	Catholic University of America	12	27	42	.09	8.3	.71	.06
	Physics	*39*	*48*	*47*	*35*	*38*	*54*	*33*
022.	Chicago, University of	38	88	115	.27	6.8	.85	.39
	Physics	*57*	*66*	*61*	*51*	*53*	*66*	*62*
023.	Cincinnati, University of	24	23	38	.19	8.0	.47	.11
	Physics	*48*	*46*	*47*	*44*	*41*	*35*	*37*
024.	Clarkson College of Technology	11	8	11	.20	6.5	.70	.20
	Physics	*39*	*42*	*42*	*45*	*56*	*54*	*45*
025.	Clemson University	23	18	5	.26	6.3	.50	.09
	Physics and Astronomy	*47*	*45*	*41*	*50*	*57*	*37*	*36*
026.	Colorado State University-Fort Collins	21	14	26	.15	9.3	.69	.31
	Physics	*45*	*44*	*44*	*41*	*29*	*53*	*54*
027.	Colorado, University of	37	72	89	.29	6.8	.63	.20
	Physics	*56*	*61*	*56*	*53*	*52*	*48*	*45*
028.	Columbia University	33	81	120	.16	7.6	.77	.36
	Physics	*54*	*64*	*62*	*41*	*45*	*60*	*59*
029.	Connecticut, University of-Storrs	31	26	31	.26	8.1	.44	.19
	Physics	*52*	*47*	*45*	*50*	*40*	*32*	*44*
030.	Cornell University-Ithaca	45	89	166	.27	6.5	.87	.36
	Physics	*62*	*67*	*71*	*51*	*55*	*68*	*59*
031.	Dartmouth College	15	21	20	.17	5.5	.79	.47
	Physics and Astronomy	*41*	*46*	*43*	*42*	*65*	*61*	*68*
032.	Delaware, University of-Newark	24	20	27	.39	8.9	.74	.44
	Physics	*48*	*45*	*45*	*62*	*33*	*57*	*65*
033.	Denver, University of	17	10	17	.27	6.3	.55	.18
	Physics	*43*	*42*	*43*	*51*	*57*	*41*	*43*
034.	Drexel University	25	13	44	.25	6.5	.57	.00
	Physics and Atmospheric Science	*48*	*43*	*48*	*49*	*56*	*43*	*28*
035.	Duke University	19	27	46	.33	5.9	.64	.46
	Physics	*44*	*48*	*48*	*57*	*62*	*48*	*67*
036.	Florida State University-Tallahassee	27	37	35	.21	6.4	.73	.33
	Physics	*50*	*51*	*46*	*46*	*56*	*56*	*56*
037.	Florida, University of-Gainesville	25	21	51	.35	6.3	.63	.08
	Physics	*48*	*46*	*49*	*58*	*58*	*47*	*35*
038.	Georgetown University	10	18	14	.35	8.0	.75	.19
	Physics	*38*	*45*	*42*	*58*	*41*	*58*	*44*
039.	Georgia Institute of Technology	23	20	37	.42	6.5	.65	.26
	Physics	*47*	*45*	*47*	*64*	*56*	*50*	*50*
040.	Harvard University	28	84	93	.35	5.6	.88	.41
	Physics	*50*	*65*	*57*	*58*	*64*	*69*	*63*

* indicates program was initiated since 1970.

NOTE: On the first line of data for every program, raw values for each measure are reported; on the second line values are reported in standardized form, with mean = 50 and standard deviation = 10. "NA" indicates that the value for a measure is not available.

TABLE 7.1 Program Measures (Raw and Standardized Values) in Physics

Prog No.	Survey Results				University Library	Research Support		Published Articles		Survey Ratings Standard Error			
	(08)	(09)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(08)	(09)	(10)	(11)
021.	2.0	1.5	0.9	0.5	NA	.58	889	38		.12	.11	.10	.07
	43	46	39	44		65	45	43	43				
022.	4.6	2.6	0.9	1.5	0.9	.50	7819	246		.07	.06	.08	.06
	70	69	41	67	57	59	61	64	69				
023.	2.0	1.5	1.0	0.5	-0.2	.25	NA	47		.12	.10	.06	.06
	43	46	46	45	47	43		44	44				
024.	1.0	0.8	0.9	0.3	NA	.55	NA	55		.17	.12	.08	.06
	34	32	39	39		62		45	44				
025.	1.8	1.2	NA	0.2	NA	.13	NA	42		.15	.17	NA	.05
	41	40		38		35		44	43				
026.	1.7	1.5	1.2	0.3	-1.1	.19	414	74		.18	.11	.10	.05
	40	46	53	39	38	39	44	47	45				
027.	3.1	1.9	1.0	1.0	-0.9	.22	3044	195		.08	.06	.08	.07
	54	55	44	57	41	41	50	59	58				
028.	4.5	2.3	0.6	1.5	1.7	.33	1701	172		.06	.06	.07	.07
	69	63	29	67	66	48	47	56	58				
029.	2.3	1.6	1.1	0.7	-0.5	.19	1284	59		.08	.09	.06	.07
	47	48	50	50	44	39	46	45	45				
030.	4.7	2.8	1.3	1.5	1.6	.18	14914	356		.05	.05	.06	.06
	70	74	58	69	65	38	78	74	76				
031.	2.2	1.9	1.1	0.4	-1 1	.20	NA	23		.21	.18	.08	.06
	46	55	50	41	38	40		42	42				
032.	2.0	1.3	1.4	0.4	NA	.29	387	67		.11	.10	.09	.07
	44	43	60	43		46	44	46	46				
033.	1.6	0.8	NA	0.1	NA	.47	1372	28		.17	.14	NA	.04
	40	32		36		57	46	42	42				
034.	1.8	1.3	1.1	0.5	NA	.16	555	48		.11	.11	.10	.07
	41	42	49	45		37	45	44	44				
035.	3.0	1.9	1.0	0.9	0.3	.26	1405	53		.10	.07	.06	.08
	53	54	45	53	52	44	46	45	45				
036.	3.0	1.8	1.3	0.8	-0.4	.44	2081	89		.10	.07	.08	.08
	53	52	59	53	45	55	48	48	49				
037.	2.6	1.7	1.5	0.7	0.8	.40	1126	85		.13	.09	.10	.08
	49	51	69	50	57	53	46	48	47				
038.	1.0	NA	NA	0.1	-0.6	.30	NA	13		.16	NA	NA	.04
	34			36	43	46		41	41				
039.	2.3	1.5	1.0	0.5	NA	.52	1781	82		.10	.09	.09	.07
	47	47	45	45		61	47	48	47				
040.	4.9	2.8	1.0	1.7	3.0	.68	5602	337		.03	.05	.06	.06
	73	73	46	72	78	71	56	73	80				

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TABLE 7.1 Program Measures (Raw and Standardized Values) in Physics

Prog No.	University - Department/Academic Unit	Program Size			Characteristics of Program Graduates			
		(01)	(02)	(03)	(04)	(05)	(06)	(07)
041.	Houston, University of	18	15	36	.15	7.8	.39	.31
	Physics	*43*	*44*	*46*	*41*	*43*	*27*	*54*
042.	Howard University	9	11	NA	NA	NA	NA	NA
	Physics	*37*	*43*					
043.	Illinois Institute of Technology	16	14	12	.23	7.1	.62	.15
	Physics	*42*	*44*	*42*	*48*	*50*	*47*	*41*
044.	Illinois, University of-Chicago Circle	28	17	34	.11	8.8	.47	.16
	Physics	*50*	*45*	*46*	*36*	*34*	*35*	*41*
045.	Illinois, University-Urbana/Champaign	68	162	287	.13	6.0	.92	.35
	Physics	*78*	*89*	*93*	*39*	*60*	*72*	*58*
046.	Indiana University-Bloomington	42	35	67	.27	7.5	.77	.43
	Physics	*60*	*50*	*52*	*51*	*46*	*60*	*65*
047.	Iowa State University-Ames	43	46	76	.30	5.9	.82	.36
	Physics	*61*	*53*	*54*	*53*	*61*	*64*	*58*
048.	Iowa, University of-Iowa City	22	35	24	.23	6.4	.53	.29
	Physics and Astronomy	*46*	*50*	*44*	*48*	*57*	*39*	*53*
049.	Johns Hopkins University	18	34	56	.34	7.3	.78	.25
	Physics	*43*	*50*	*50*	*58*	*48*	*61*	*49*
050.	Kansas State University-Manhattan	24	11	10	.13	5.3	.60	.13
	Physics	*48*	*43*	*41*	*39*	*67*	*45*	*39*
051.	Kansas, University of	24	15	20	.33	6.9	.44	.28
	Physics and Astronomy	*48*	*44*	*43*	*57*	*52*	*32*	*52*
052.	Kent State University	16	15	50	.31	6.8	.56	.19
	Physics	*42*	*44*	*49*	*55*	*53*	*42*	*44*
053.	Kentucky, University of	22	9	11	.30	6.4	NA	NA
	Physics and Astronomy	*46*	*42*	*42*	*54*	*57*		
054.	Louisiana State University-Baton Rouge	30	13	32	.25	6.9	.67	.24
	Physics and Astronomy	*52*	*43*	*46*	*49*	*51*	*51*	*48*
055.	Maryland, University of-College Park	75	144	181	.17	7.0	.65	.30
	Physics and Astronomy	*82*	*84*	*73*	*42*	*50*	*49*	*54*
056.	Massachusetts Institute of Technology	87	195	300	.25	5.6	.72	.36
	Physics	*91*	*99*	*96*	*50*	*64*	*56*	*59*
057.	Massachusetts, University of-Amherst	35	29	42	.35	7.2	.68	.32
	Physics and Astronomy	*55*	*48*	*47*	*58*	*49*	*52*	*56*
058.	Michigan State University-East Lansing	48	26	68	.16	5.8	.67	.30
	Physics	*64*	*47*	*52*	*41*	*62*	*51*	*54*
059.	Michigan, University of-Ann Arbor	50	51	81	.29	6.6	.62	.28
	Physics	*65*	*55*	*55*	*53*	*54*	*47*	*52*
060.	Minnesota, University of	46	43	83	.28	7.8	.66	.42
	Physics and Astronomy	*63*	*53*	*55*	*52*	*43*	*50*	*63*

* indicates program was initiated since 1970.

NOTE: On the first line of data for every program, raw values for each measure are reported; on the second line values are reported in standardized form, with mean = 50 and standard deviation = 10. "NA" indicates that the value for a measure is not available.

TABLE 7.1 Program Measures (Raw and Standardized Values) in Physics

Prog	Survey Results				University Library	Research Support		Published Articles		Survey Ratings Standard Error			
No.	(08)	(09)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(08)	(09)	(10)	(11)
041.	2.1	1.3	1.6	0.3	-0.9	.44	542	77		.17	.16	.12	.06
	45	*42*	*72*	*39*	*40*	*55*	*44*	*47*	*47*				
042.	1.1	1.0	NA	0.2	-0.4	NA	NA	27		.23	.18	NA	.05
	34	*36*		*37*	*45*			*42*	*42*				
043.	1.7	1.1	1.0	0.4	NA	.56	NA	42		.11	.14	.12	.06
	40	*39*	*45*	*43*		*63*		*44*	*44*				
044.	2.1	1.4	1.2	0.6	NA	.32	1014	47		.13	.11	.12	.08
	44	*45*	*52*	*47*		*47*	*46*	*44*	*44*				
045.	4.3	2.5	1.1	1.6	2.0	.46	4815	363		.07	.06	.06	.06
	67	*66*	*50*	*70*	*68*	*56*	*54*	*75*	*75*				
046.	3.1	1.9	1.2	1.0	0.9	.38	4224	112		.07	.07	.07	.07
	55	*54*	*55*	*56*	*58*	*51*	*53*	*51*	*51*				
047.	2.9	1.8	1.0	0.7	-0.5	.14	NA	106		.11	.08	.07	.07
	53	*52*	*46*	*50*	*44*	*36*		*50*	*50*				
048.	2.5	1.8	1.0	0.5	0.3	.50	3475	58		.12	.09	.04	.07
	49	*52*	*43*	*45*	*52*	*59*	*51*	*45*	*45*				
049.	3.1	1.9	0.8	0.8	-0.4	.39	2000	89		.09	.05	.07	.07
	55	*56*	*36*	*51*	*45*	*52*	*48*	*48*	*49*				
050.	2.0	1.2	0.9	0.3	NA	.21	NA	66		.18	.12	.10	.06
	43	*41*	*42*	*41*		*40*		*46*	*46*				
051.	2.2	1.5	1.0	0.6	0.1	.33	NA	21		.11	.10	.08	.08
	45	*46*	*45*	*47*	*50*	*48*		*42*	*42*				
052.	1.7	1.2	1.2	0.4	-1.8	.44	NA	20		.13	.14	.13	.07
	41	*41*	*53*	*42*	*32*	*55*		*42*	*42*				
053.	1.8	1.2	1.4	0.6	-0.1	.23	NA	27		.10	.13	.12	.08
	41	*40*	*62*	*47*	*48*	*41*		*42*	*42*				
054.	2.5	1.4	1.3	0.7	-0.3	.37	1340	65		.10	.11	.08	.06
	49	*44*	*59*	*50*	*46*	*50*	*46*	*46*	*46*				
055.	3.7	2.1	0.9	1.4	0.2	.31	8341	290		.07	.06	.06	.07
	61	*59*	*38*	*67*	*51*	*47*	*62*	*68*	*68*				
056.	4.8	2.7	1.0	1.7	-0.3	.31	31429	559		.04	.05	.06	.05
	72	*71*	*45*	*73*	*46*	*47*	*99*	*94*	*97*				
057.	2.7	1.7	1.4	0.8	-0.7	.37	1267	68		.09	.07	.10	.07
	50	*51*	*61*	*53*	*42*	*51*	*46*	*46*	*48*				
058.	3.2	1.9	1.3	1.1	0.3	.50	2612	144		.10	.06	.09	.08
	56	*55*	*59*	*60*	*52*	*59*	*49*	*54*	*55*				
059.	3.7	2.1	1.0	1.1	1.8	.42	2912	169		.07	.05	.08	.08
	60	*60*	*43*	*60*	*66*	*54*	*50*	*56*	*56*				
060.	3.5	2.0	1.0	1.0	1.2	.28	2664	197		.07	.06	.08	.07
	59	*57*	*44*	*56*	*60*	*45*	*49*	*59*	*59*				

NOTE: On the first line of data for every program, raw values for each measure are reported; on the second line values are reported in standardized form, with mean = 50 and standard deviation = 10. "NA" indicates that the value for a measure is not available. Since the scale used to compute measure (16) is entirely arbitrary, only values in standardized form are reported for this measure.

TABLE 7.1 Program Measures (Raw and Standardized Values) in Physics

Prog No.	University - Department/Academic Unit	Program Size (01)	(02)	(03)	Characteristics of Program Graduates (04)	(05)	(06)	(07)
061.	Missouri, University of-Columbia	19	17	20	.06	6.6	.59	.18
	Physics	*44*	*45*	*43*	*32*	*54*	*44*	*43*
062.	Missouri, University of-Rolla	22	21	23	.27	6.0	.73	.13
	Physics	*46*	*46*	*44*	*51*	*60*	*56*	*39*
063.	Montana State University-Bozeman	13	12	25	.50	8.8	.50	.10
	Physics	*40*	*43*	*44*	*71*	*33*	*37*	*36*
064.	Nebraska, University of-Lincoln	30	15	37	.27	9.0	.68	.32
	Physics and Astronomy	*52*	*44*	*47*	*51*	*32*	*52*	*55*
065.	Nevada, University of-Reno	12	15	9	NA	NA	NA	NA
	Physics	*39*	*44*	*41*				
066.	New Hampshire, University of	17	17	20	.24	6.2	.56	.25
	Physics	*43*	*45*	*43*	*48*	*59*	*42*	*49*
067.	New Mexico State University-Las Cruces	13	15	24	.50	8.8	.50	.17
	Physics	*40*	*44*	*44*	*71*	*34*	*37*	*42*
068.	New Mexico, University of-Albuquerque	22	15	45	.23	7.0	.67	.14
	Physics and Astronomy	*46*	*44*	*48*	*47*	*51*	*51*	*40*
069.	New York University	26	50	59	.48	8.6	.68	.20
	Physics	*49*	*55*	*51*	*69*	*36*	*52*	*45*
070.	North Carolina State University-Raleigh	31	18	38	.40	7.5	.60	.15
	Physics	*52*	*45*	*47*	*62*	*46*	*45*	*41*
071.	North Carolina, University of-Chapel Hill	30	37	43	.12	6.3	.71	.32
	Physics and Astronomy	*52*	*51*	*48*	*38*	*58*	*54*	*56*
072.	North Texas State University-Denton	12	19	23	.30	9.0	.74	.21
	Physics	*39*	*45*	*44*	*54*	*32*	*57*	*46*
073.	Northeastern University	32	18	64	.16	7.5	.37	.21
	Physics	*53*	*45*	*52*	*41*	*46*	*26*	*46*
074.	Northwestern University	24	26	45	.26	6.5	.71	.50
	Physics and Astronomy	*48*	*47*	*48*	*50*	*56*	*54*	*71*
075.	Notre Dame, University of	21	30	37	.16	6.3	.80	.34
	Physics	*45*	*49*	*47*	*41*	*57*	*62*	*57*
076.	Ohio State University-Columbus	36	57	105	.12	6.7	.60	.26
	Physics	*56*	*57*	*59*	*38*	*54*	*45*	*50*
077.	Ohio University-Athens	19	26	58	.08	7.8	.71	.24
	Physics	*44*	*47*	*50*	*34*	*43*	*55*	*48*
078.	Oklahoma State University-Stillwater	22	25	26	.33	6.5	.75	.17
	Physics	*46*	*47*	*44*	*57*	*56*	*58*	*42*
079.	Oklahoma, University of-Norman	22	16	16	.24	9.0	.71	.24
	Physics and Astronomy	*46*	*44*	*43*	*48*	*32*	*54*	*48*
080.	Oregon State University-Corvallis	17	6	17	NA	7.5	NA	NA
	Physics	*43*	*41*	*43*		*46*		

* indicates program was initiated since 1970.

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TABLE 7.1 Program Measures (Raw and Standardized Values) in Physics

Prog	Survey Results				University Library	Research Support		Published Articles		Survey Ratings Standard Error			
No.	(08)	(09)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(08)	(09)	(10)	(11)
061.	2.0	1.3	1.5	0.3	-0.2	.26	NA	44		.15	.15	.11	.06
	43	43	66	41	47	44		44	43				
062.	2.0	1.6	1.3	0.4	NA	.46	1287	70		.15	.13	.13	.06
	43	49	60	43		56	46	46	45				
063.	1.8	1.3	1.4	0.4	NA	.31	565	28		.16	.15	.13	.07
	41	42	62	42		47	45	42	42				
064.	2.4	1.6	1.0	0.6	-0.5	.33	1203	68		.11	.11	.08	.07
	48	48	45	46	44	48	46	46	47				
065.	0.9	NA	NA	0.1	NA	.00	NA	15		.19	NA	NA	.03
	32			35		27		41	41				
066.	1.7	NA	1.3	0.2	NA	.47	NA	16		.11	NA	.11	.04
	40		56	38		57		41	42				
067.	NA	NA	NA	NA	NA	.08	392	25		NA	NA	NA	NA
						32	44	42	42				
068.	2.1	1.3	1.7	0.4	-1.0	.18	406	21		.15	.17	.13	.07
	44	43	75	41	40	38	44	42	42				
069.	3.2	1.9	0.9	0.9	0.5	.54	1659	132		.08	.05	.07	.07
	55	55	41	55	54	62	47	53	55				
070.	2.2	1.4	1.6	0.5	NA	.23	400	57		.11	.12	.09	.07
	45	45	72	44		41	44	45	44				
071.	3.0	1.9	1.1	0.9	1.0	.30	546	75		.08	.07	.08	.06
	53	55	50	53	59	46	44	47	47				
072.	1.3	0.7	1.2	0.4	NA	.08	382	23		.16	.20	.11	.07
	36	30	52	41		32	44	42	43				
073.	2.7	1.7	1.1	0.8	NA	.44	1223	58		.10	.09	.08	.07
	50	50	47	51		55	46	45	46				
074.	3.0	1.9	1.0	0.9	0.3	.38	1254	154		.09	.06	.08	.08
	54	55	44	54	52	51	46	55	55				
075.	2.4	1.6	1.0	0.7	-1.3	.67	850	82		.10	.08	.09	.08
	47	48	45	50	36	70	45	48	49				
076.	3.0	1.8	1.2	0.9	0.9	.50	1675	118		.09	.06	.08	.07
	53	53	52	55	57	59	47	51	51				
077.	2.0	1.6	1.1	0.5	NA	.16	NA	16		.12	.11	.09	.07
	44	48	48	45		37		41	41				
078.	1.8	1.2	NA	0.2	-1.9	.27	NA	45		.16	.14	NA	.05
	41	40		37	30	44		44	44				
079.	2.1	1.4	1.5	0.3	-0.6	.27	NA	34		.12	.12	.12	.05
	44	44	68	40	44	44		43	43				
080.	1.8	1.2	1.0	0.3	NA	.29	NA	47		.15	.13	.09	.06
	41	40	45	40		46		44	45				

NOTE: On the first line of data for every program, raw values for each measure are reported; on the second line values are reported in standardized form, with mean = 50 and standard deviation = 10. "NA" indicates that the value for a measure is not available. Since the scale used to compute measure (16) is entirely arbitrary, only values in standardized form are reported for this measure.

TABLE 7.1 Program Measures (Raw and Standardized Values) in Physics

Prog No.	University - Department/Academic Unit	Program Size (01)	(02)	(03)	Characteristics of Program Graduates (04)	(05)	(06)	(07)
081.	Oregon, University of-Eugene	19	38	64	.27	7.2	.42	.13
	Physics	*44*	*51*	*52*	*51*	*49*	*30*	*39*
082.	Pennsylvania State University	32	51	67	.15	7.9	.63	.17
	Physics	*53*	*55*	*52*	*41*	*43*	*48*	*43*
083.	Pennsylvania, University of	46	52	74	.29	6.0	.74	.46
	Physics	*63*	*55*	*53*	*53*	*61*	*57*	*67*
084.	Pittsburgh, University of	42	60	80	.08	7.7	.73	.36
	Physics and Astronomy	*60*	*58*	*55*	*34*	*44*	*56*	*58*
085.	Polytech Institute of New York	11	12	19	.33	7.8	.56	.17
	Physics	*39*	*43*	*43*	*57*	*43*	*42*	*42*
086.	Princeton University	51	90	83	.45	5.2	.81	.46
	Physics	*66*	*67*	*55*	*67*	*68*	*63*	*67*
087.	Rensselaer Polytechnic Institute	25	23	30	.23	7.0	.59	.27
	Physics	*48*	*46*	*45*	*47*	*51*	*45*	*51*
088.	Rice University	21	38	42	.46	5.9	.71	.29
	Physics	*45*	*51*	*47*	*67*	*61*	*55*	*53*
089.	Rochester, University of	30	68	68	.15	7.1	.77	.33
	Physics and Astronomy	*52*	*60*	*52*	*40*	*50*	*59*	*56*
090.	Rockefeller University	15	6	9	NA	NA	NA	NA
	Physics	*41*	*41*	*41*				
091.	Rutgers, The State University-New Brunswick	41	34	84	.18	6.5	.74	.45
	Physics	*59*	*50*	*55*	*43*	*56*	*57*	*66*
092.	SUNY at Albany	14	20	44	.31	9.2	.69	.31
	Physics	*41*	*45*	*48*	*55*	*30*	*53*	*55*
093.	SUNY at Buffalo	12	26	40	.16	8.4	.79	.38
	Physics and Astronomy	*39*	*47*	*47*	*41*	*38*	*61*	*60*
094.	SUNY at Stony Brook	52	82	141	.14	5.8	.74	.33
	Physics	*67*	*65*	*66*	*39*	*62*	*57*	*56*
095.	South Carolina, University of-Columbia	17	20	30	.20	7.7	.50	.13
	Physics and Astronomy	*43*	*45*	*45*	*45*	*44*	*37*	*39*
096.	Southern California, University of	20	31	34	.14	6.8	.58	.11
	Physics	*45*	*49*	*46*	*40*	*53*	*44*	*37*
097.	Southern Illinois University-Carbondale	61	8	12	.00	10.5	.42	.17
	Molecular Science	*73*	*42*	*42*	*27*	*17*	*30*	*42*
098.	Stanford University	14	52	100	.41	5.8	.69	.16
	Applied Physics	*41*	*55*	*58*	*63*	*62*	*53*	*41*
099.	Stanford University	23	68	121	.58	6.2	.74	.49
	Physics	*47*	*60*	*62*	*79*	*58*	*57*	*70*
100.	Stevens Institute of Technology	19	21	37	.30	8.6	.63	.21
	Physics and Engineering Physics	*44*	*46*	*47*	*54*	*35*	*48*	*46*

* indicates program was initiated since 1970.

NOTE: On the first line of data for every program, raw values for each measure are reported; on the second line values are reported in standardized form, with mean = 50 and standard deviation = 10. "NA" indicates that the value for a measure is not available.

TABLE 7.1 Program Measures (Raw and Standardized Values) in Physics

Prog	Survey Results				University Library	Research Support		Published Articles		Survey Ratings Standard Error			
No.	(08)	(09)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(08)	(09)	(10)	(11)
081.	2.8	1.6	1.1	0.8	-0.9	.53	918	74		.10	.08	.09	.06
	51	50	47	52	40	61	45	47	47				
082.	2.5	1.8	1.1	0.8	0.7	.44	NA	151		.09	.07	.08	.07
	48	52	47	52	56	55		54	51				
083.	4.0	2.3	0.8	1.4	0.7	.30	5386	295		.07	.05	.08	.07
	64	62	37	66	56	46	56	68	69				
084.	3.2	1.9	1.1	1.1	0.1	.71	2549	144		.08	.07	.07	.07
	55	55	49	58	50	73	49	54	54				
085.	1.9	1.2	1.0	0.3	NA	.27	NA	30		.19	.18	.18	.06
	42	40	43	40		44		43	43				
086.	4.9	2.8	0.9	1.6	0.9	.28	3761	239		.03	.05	.06	.06
	72	72	42	70	58	44	52	63	62				
087.	2.5	1.9	1.0	0.6	NA	.40	NA	73		.08	.05	.09	.07
	48	55	45	47		53		47	46				
088.	2.9	1.9	1.0	0.8	-1.4	.29	1031	87		.11	.08	.09	.08
	52	55	43	51	35	45	46	48	48				
089.	3.5	2.0	0.8	1.2	-0.6	.43	4092	243		.07	.06	.07	.06
	58	57	37	62	43	55	53	63	64				
090.	3.9	1.9	0.8	1.0	NA	.27	1609	66		.09	.10	.07	.08
	63	55	35	57		44	47	46	49				
091.	3.1	1.9	1.1	1.1	0.8	.49	2608	133		.09	.06	.09	.08
	55	55	50	60	57	58	49	53	52				
092.	1.8	1.2	1.1	0.6	-1.0	.43	483	60		.13	.11	.08	.07
	41	41	48	47	40	55	44	45	46				
093.	1.7	1.0	0.8	0.4	0.3	.50	NA	74		.14	.11	.11	.06
	40	37	35	43	52	59		47	46				
094.	4.1	2.2	1.3	1.4	-0.6	.31	3469	230		.08	.06	.07	.06
	65	62	58	66	43	47	51	62	64				
095.	1.7	1.1	1.3	0.3	-0.4	.29	NA	35		.14	.15	.11	.06
	40	38	56	41	45	46		43	43				
096.	2.7	1.7	1.1	0.6	0.4	.35	900	196		.11	.09	.10	.07
	50	51	49	48	52	49	45	59	56				
097.	1.4	0.7	NA	0.1	-0.2	.13	NA	6		.16	.11	NA	.03
	38	31		36	47	35		40	40				
098.	4.2	2.6	1.2	0.9	2.0	.64	14262	365		.11	.08	.09	.09
	65	69	52	53	69	68	76	75	71				
099.	4.6	2.7	1.0	1.5	2.0	.65	14262	365		.07	.06	.05	.06
	70	71	43	70	69	69	76	75	71				
100.	2.4	1.5	0.8	0.6	NA	.21	508	23		.12	.13	.10	.07
	47	46	36	46		40	44	42	41				

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TABLE 7.1 Program Measures (Raw and Standardized Values) in Physics

Prog No.	University - Department/Academic Unit	Program Size			Characteristics of Program Graduates			
		(01)	(02)	(03)	(04)	(05)	(06)	(07)
101.	Syracuse University	20	29	38	.16	7.4	.52	.24
	Physics	*45*	*48*	*47*	*41*	*47*	*38*	*49*
102.	Temple University	24	14	34	.21	8.8	.37	.05
	Physics	*48*	*44*	*46*	*46*	*33*	*26*	*32*
103.	Tennessee, University of-Knoxville	43	33	36	.36	7.1	.48	.16
	Physics and Astronomy	*61*	*49*	*46*	*59*	*50*	*36*	*42*
104.	Texas A & M University	35	29	34	.35	7.5	.56	.24
	Physics	*55*	*48*	*46*	*58*	*46*	*42*	*48*
105.	Texas, U of-Health Science Center, Houston	19	9	7	NA	NA	NA	NA
	Physics (M D Anderson Hospital)	*44*	*42*	*41*				
106.	Texas, University of-Austin	58	89	202	.32	6.0	.67	.31
	Physics	*71*	*67*	*77*	*56*	*60*	*51*	*54*
107.	Texas, University of-Dallas	21	18	46	.00	6.6	.71	.47
	*Physics**	*45*	*45*	*48*	*27*	*55*	*54*	*68*
108.	Tufts University	20	7	21	NA	NA	NA	NA
	Physics	*45*	*41*	*44*				
109.	Tulane University	10	4	10	NA	NA	NA	NA
	Physics	*38*	*41*	*41*				
110.	Utah State University-Logan	15	11	15	.27	6.5	.60	.00
	Physics	*41*	*43*	*42*	*51*	*56*	*45*	*28*
111.	Utah, University of-Salt Lake City	17	20	24	.22	7.0	.67	.22
	Physics	*43*	*45*	*44*	*47*	*51*	*51*	*47*
112.	Vanderbilt University	18	17	17	.50	6.8	.75	.31
	Physics and Astronomy	*43*	*45*	*43*	*71*	*52*	*58*	*55*
113.	Virginia Polytechnic Institute & State Univ	36	11	21	.55	6.0	.91	.18
	Physics	*56*	*43*	*44*	*75*	*60*	*71*	*43*
114.	Virginia, University of	31	53	58	.23	5.8	.66	.26
	Physics	*52*	*56*	*50*	*48*	*62*	*50*	*50*
115.	Washington State University-Pullman	16	16	20	.29	7.8	.64	.14
	Physics	*42*	*44*	*43*	*52*	*44*	*49*	*40*
116.	Washington University-Saint Louis	26	31	61	.32	6.1	.68	.32
	Physics	*49*	*49*	*51*	*55*	*59*	*52*	*55*
117.	Washington, University of-Seattle	45	45	37	.18	7.0	.71	.41
	Physics	*62*	*53*	*47*	*43*	*51*	*55*	*63*
118.	Wayne State University	24	16	14	.25	6.8	.73	.33
	Physics and Astronomy	*48*	*44*	*42*	*49*	*53*	*56*	*56*
119.	William & Mary, College of	24	21	32	.42	6.4	.58	.12
	Physics	*48*	*46*	*46*	*65*	*57*	*43*	*38*
120.	Wisconsin, University of-Madison	54	29	163	.17	7.3	.60	.26
	Physics	*68*	*48*	*70*	*42*	*48*	*45*	*50*

* indicates program was initiated since 1970.

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TABLE 7.1 Program Measures (Raw and Standardized Values) in Physics

Prog No.	Survey Results				University Library	Research Support		Published Articles		Survey Ratings Standard Error			
	(08)	(09)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(08)	(09)	(10)	(11)
101.	2.9	1.9	1.1	0.7	-0.3	.40	1217	73		.11	.08	.06	.08
	52	*55*	*47*	*49*	*46*	*53*	*46*	*47*	*47*				
102.	2.3	1.5	0.9	0.5	-0.4	.29	405	39		.12	.11	.09	.06
	46	*46*	*42*	*46*	*45*	*46*	*44*	*43*	*44*				
103.	2.5	1.6	1.3	0.5	-0.4	.02	710	65		.11	.10	.09	.06
	49	*48*	*56*	*44*	*45*	*28*	*45*	*46*	*46*				
104.	2.6	1.6	1.4	0.7	-0.5	.31	663	121		.10	.09	.09	.08
	50	*48*	*63*	*50*	*44*	*47*	*45*	*51*	*53*				
105.	NA	NA	NA	0.1	NA	.37	NA	NA		NA	NA	NA	.03
				34		*51*			*NA*				
106.	3.9	1.9	1.9	1.1	1.6	.31	8726	293		.08	.07	.04	.05
	62	*55*	*83*	*60*	*65*	*47*	*63*	*68*	*66*				
107.	1.9	1.1	NA	0.2	NA	.24	3407	NA		.16	.16	NA	.06
	43	*39*		*39*		*42*	*51*		*NA*				
108.	2.2	1.5	1.0	0.4	NA	.25	NA	29		.14	.13	.05	.06
	45	*48*	*43*	*42*		*43*		*42*	*42*				
109.	1.2	0.7	1.1	0.3	-1.0	.30	NA	9		.18	.15	.17	.05
	35	*30*	*51*	*40*	*39*	*46*		*40*	*41*				
110.	1.4	1.0	NA	0.1	NA	.33	NA	11		.17	.16	NA	.04
	37	*37*		*36*		*48*		*41*	*41*				
111.	2.4	1.6	1.4	0.7	-0.6	.82	1171	112		.11	.12	.10	.08
	47	*48*	*60*	*48*	*43*	*80*	*46*	*51*	*50*				
112.	2.3	1.6	1.1	0.5	-0.7	.33	657	29		.13	.10	.15	.06
	46	*49*	*49*	*44*	*42*	*48*	*45*	*42*	*43*				
113.	2.9	1.6	1.6	0.8	-0.0	.33	801	74		.11	.09	.09	.08
	52	*48*	*73*	*53*	*49*	*48*	*45*	*47*	*45*				
114.	2.9	1.9	1.3	1.0	0.7	.45	1424	119		.08	.07	.09	.07
	53	*54*	*59*	*57*	*56*	*56*	*47*	*51*	*52*				
115.	1.2	1.1	NA	0.2	-0.3	.25	424	31		.15	.14	NA	.04
	36	*38*		*37*	*46*	*43*	*44*	*43*	*42*				
116.	2.8	1.8	1.0	0.8	-0.4	.31	1579	64		.09	.10	.09	.06
	51	*53*	*44*	*51*	*45*	*47*	*47*	*46*	*46*				
117.	3.9	2.1	1.5	1.3	1.5	.51	3339	176		.06	.06	.07	.06
	62	*60*	*65*	*64*	*63*	*60*	*51*	*57*	*57*				
118.	1.8	1.1	0.7	0.4	-0.4	.38	NA	77		.10	.12	.10	.06
	42	*39*	*31*	*43*	*45*	*51*		*47*	*47*				
119.	2.4	1.6	1.2	0.6	NA	.50	468	34		.11	.09	.08	.06
	47	*48*	*53*	*46*		*59*	*44*	*43*	*43*				
120.	3.8	2.1	0.9	1.4	1.6	.26	5082	279		.08	.06	.06	.07
	61	*60*	*42*	*65*	*64*	*43*	*55*	*67*	*65*				

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TABLE 7.1 Program Measures (Raw and Standardized Values) in Physics

		Program Size			Characteristics of Program Graduates			
Prog No.	University - Department/Academic Unit	(01)	(02)	(03)	(04)	(05)	(06)	(07)
121.	Wisconsin, University of-Milwaukee	17	13	15	.24	7.3	.75	.13
	Physics	*43*	*43*	*42*	*48*	*48*	*58*	*39*
122.	Wyoming, University of	18	16	21	.23	6.7	.55	.14
	Physics and Astronomy	*43*	*44*	*44*	*47*	*54*	*41*	*40*
123.	Yale University	39	54	103	.24	5.6	.77	.39
	Physics	*58*	*56*	*59*	*49*	*64*	*60*	*61*

* indicates program was initiated since 1970.

NOTE: On the first line of data for every program, raw values for each measure are reported; on the second line values are reported in standardized form, with mean = 50 and standard deviation = 10. "NA" indicates that the value for a measure is not available.

TABLE 7.1 Program Measures (Raw and Standardized Values) in Physics

Prog	Survey Results				University Library	Research Support		Published Articles		Survey Ratings Standard Error			
No.	(08)	(09)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(08)	(09)	(10)	(11)
121.	1.8	1.3	1.0	0.4	NA	.35	415	NA		.17	.11	.14	.06
	42	*42*	*45*	*42*		*50*	*44*		*NA*				
122.	1.7	1.2	1.1	0.3	NA	.28	936	11		.14	.17	.12	.06
	40	*40*	*51*	*40*		*45*	*45*	*41*	*41*				
123.	4.2	2.4	0.9	1.4	2.1	.15	4215	178		.08	.06	.07	.07
	65	*65*	*42*	*66*	*69*	*37*	*53*	*57*	*57*				

NOTE: On the first line of data for every program, raw values for each measure are reported; on the second line values are reported in standardized form, with mean = 50 and standard deviation = 10. "NA" indicates that the value for a measure is not available. Since the scale used to compute measure (16) is entirely arbitrary, only values in standardized form are reported for this measure.

TABLE 7.2 Summary Statistics Describing Each Program Measure--Physics

Measure	Number of Programs Evaluated	Mean	Standard Deviation	DECILES 1	2	3	4	5	6	7	8	9
Program Size												
01 Raw Value	123	28	15	12	17	19	21	23	25	31	37	46
Std Value	123	50	10	39	43	44	45	47	48	52	56	63
02 Raw Value	123	35	33	11	15	16	19	24	29	35	51	69
Std Value	123	50	10	43	44	44	45	47	48	50	55	61
03 Raw Value	122	56	53	14	20	25	34	38	44	58	81	111
Std Value	122	50	10	42	43	44	46	47	48	50	55	60
Program Graduates												
04 Raw Value	115	.26	.11	.13	.16	.20	.23	.26	.28	.31	.35	.41
Std Value	115	50	10	38	41	45	47	50	52	55	58	64
05 Raw Value	115	7.1	1.1	8.8	7.9	7.5	7.2	7.0	6.6	6.5	6.2	5.9
Std Value	115	50	10	34	42	46	49	51	55	56	58	61
06 Raw Value	114	.66	.12	.48	.56	.60	.64	.68	.70	.72	.75	.78
Std Value	114	50	10	35	42	45	48	52	53	55	58	60
07 Raw Value	114	.26	.12	.11	.15	.18	.22	.26	.30	.33	.36	.41
Std Value	114	50	10	38	41	43	47	50	53	56	58	63
Survey Results												
08 Raw Value	121	2.7	1.0	1.5	1.8	2.0	2.3	2.5	2.8	3.0	3.5	4.1
Std Value	121	50	10	38	41	43	46	48	52	54	59	65
09 Raw Value	118	1.7	.5	1.1	1.2	1.4	1.6	1.6	1.8	1.9	2.0	2.3
Std Value	118	50	10	39	41	45	49	49	53	55	57	63
10 Raw Value	109	1.1	.2	.9	.9	1.0	1.0	1.1	1.1	1.2	1.3	1.4
Std Value	109	50	10	41	41	45	45	50	50	54	58	63
11 Raw Value	122	.7	.4	.2	.3	.4	.5	.7	.8	.9	1.1	1.4
Std Value	122	50	10	38	40	42	45	50	52	54	59	66
University Library												
12 Raw Value	83	.1	1.0	-1.1	-.7	-.5	-.4	-.2	.2	.6	.9	1.7
Std Value	83	50	10	38	42	44	45	47	51	55	58	65
Research Support												
13 Raw Value	121	.36	.15	.16	.24	.28	.31	.33	.39	.44	.49	.54
Std Value	121	50	10	37	42	45	47	48	52	55	59	62
14 Raw Value	88	2943	4353	415	591	876	1206	1372	1696	2610	3893	6502
Std Value	88	50	10	44	45	45	46	46	47	49	52	58
Publication Records												
15 Raw Value	120	106	102	19	28	42	57	68	82	119	169	269
Std Value	120	50	10	41	42	44	45	46	48	51	56	66
16 Std Value	120	50	10	42	42	44	45	46	48	51	56	66

NOTE: Standardized values reported in the preceding table have been computed from exact values of the mean and standard deviation and not the rounded values reported here. Since the scale used to compute measure 16 is entirely arbitrary, only data in standardized form are reported for this measure.

TABLE 7.3 Intercorrelations Among Program Measures on 123 Programs in Physics

	Measure															
	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16
Program Size																
01		.77	.80	-.13	.21	.19	.38	.68	.60	.02	.71	.44	-.07	.54	.71	.72
02			.92	-.02	.32	.40	.41	.76	.73	-.17	.78	.47	.13	.66	.85	.86
03				-.05	.28	.34	.39	.75	.70	-.09	.77	.54	.09	.68	.86	.85
Program Graduates																
04					.11	.17	.01	.15	.19	.06	.11	.05	-.03	.04	.07	.05
05						.34	.29	.42	.44	.00	.38	.23	.21	.31	.37	.38
06							.51	.42	.44	-.14	.43	.25	.13	.25	.41	.43
07								.58	.56	-.18	.56	.34	.14	.31	.47	.48
Survey Results																
08									.96	-.15	.96	.67	.24	.61	.85	.86
09										-.17	.92	.65	.23	.61	.82	.82
10											-.18	-.11	-.05	-.08	-.13	-.14
11												.66	.27	.58	.85	.86
University Library																
12													.17	.33	.63	.61
Research Support																
13														.07	.20	.21
14															.80	.80
Publication Records																
15																.99
16																

NOTE: Since in computing correlation coefficients program data must be available for both of the measures being correlated, the actual number of programs on which each coefficient is based varies.

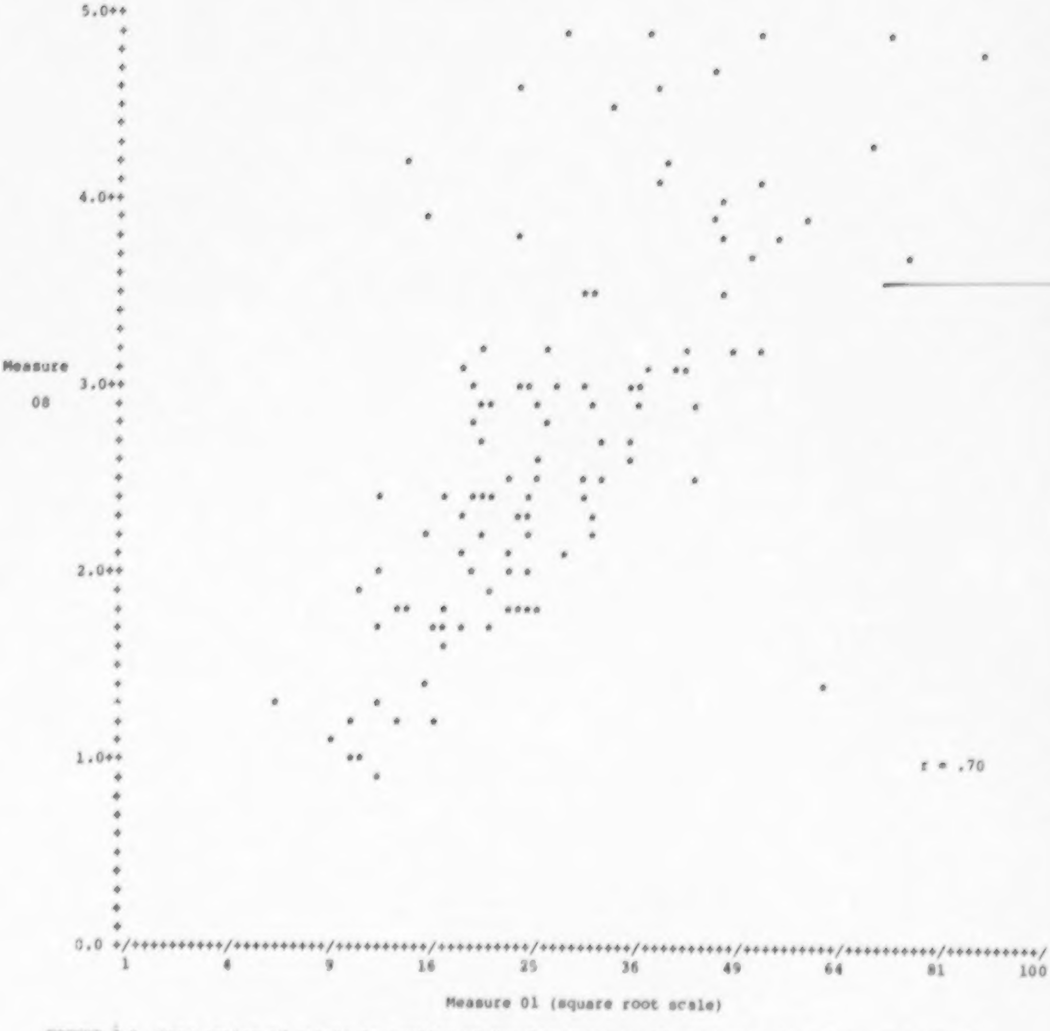

FIGURE 7.1 Mean rating of scholarly quality of faculty (measure 08) versus number of faculty members (measure 01)--121 programs in physics.

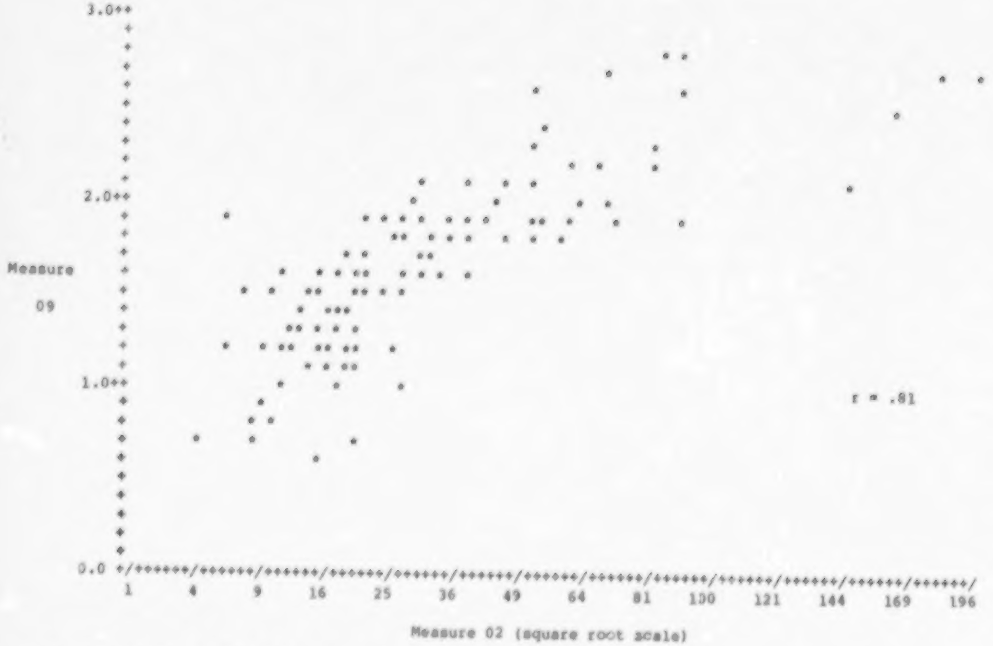

FIGURE 7.2 Mean rating of program effectiveness in educating research scholars/scientists (measure 09) versus number of graduates in last five years (measure 02)--118 programs in physics.

TABLE 7.4 Characteristics of Survey Participants in Physics

	Respondents	
	N	%
Field of Specialization		
Atomic/Molecular Physics	29	14
Elementary Particles	56	27
Nuclear Structure	30	14
Solid State Physics	55	26
Other/Unknown	41	19
Faculty Rank		
Professor	148	70
Associate Professor	50	24
Assistant Professor	13	6
Year of Highest Degree		
Pre-1950	13	6
1950-59	62	29
1960-69	103	49
Post-1969	32	15
Unknown	1	1
Evaluator Selection		
Nominated by Institution	169	80
Other	42	20
Survey Form		
With Faculty Names	191	91
Without Names	20	10
Total Evaluators	211	100

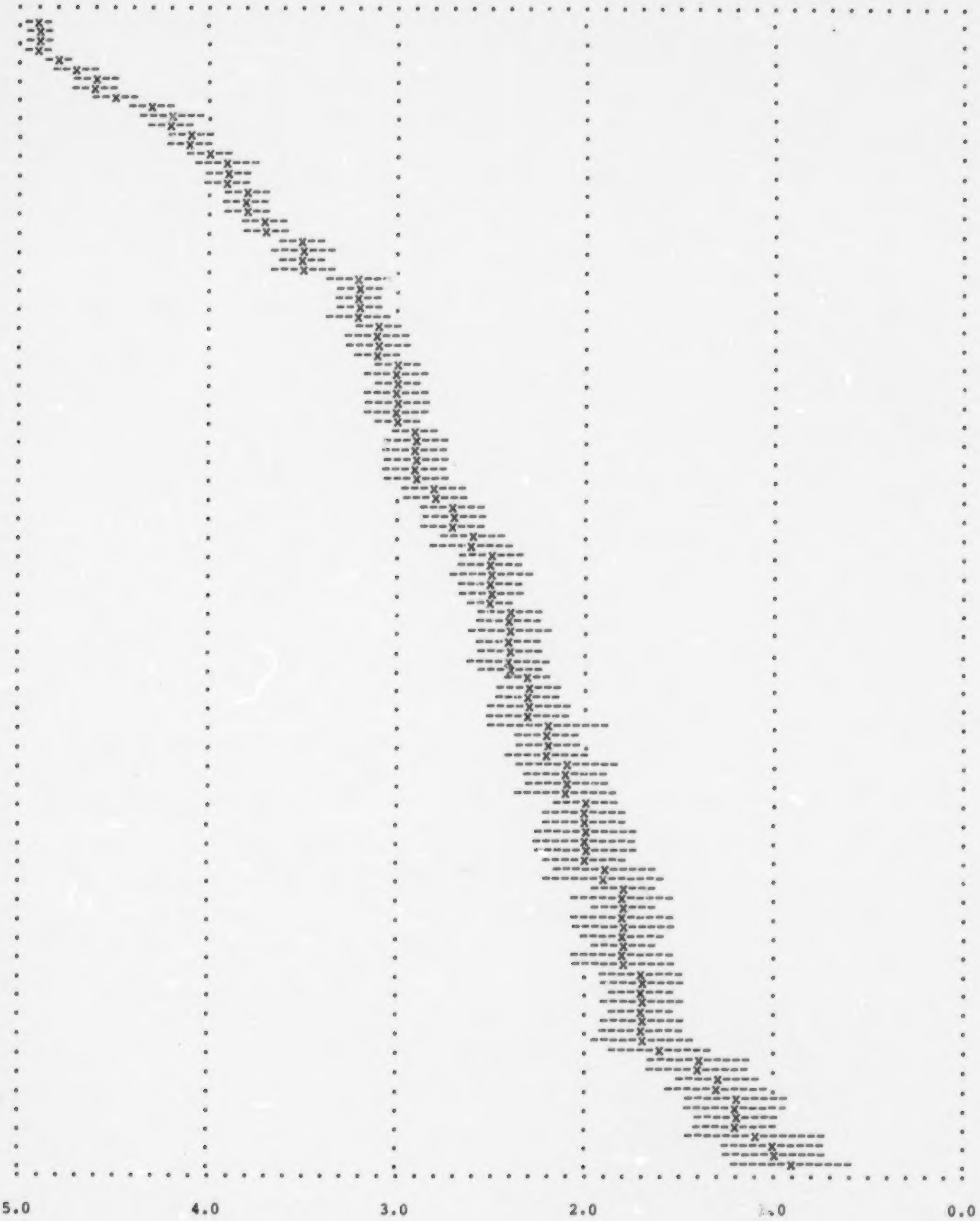

FIGURE 7.3 Mean rating of scholarly quality of faculty in 121 programs in physics.

NOTE: Programs are listed in sequence of mean rating, with the highest-rated program appearing at the top of the page. The broken lines (---) indicate a confidence interval of ±1.5 standard errors around the reported mean (x) of each program.

VIII

Statistics/Biostatistics Programs

In this chapter 64 research-doctorate programs in statistics/ biostatistics are assessed. These programs, according to the information supplied by their universities, have accounted for 906 doctoral degrees awarded during the FY1976-80 period--approximately 87 percent of the aggregate number of statistics/biostatistics doctorates earned from U.S. universities in this five-year span.[1] On the average, 22 full-time and part-time students intending to earn doctorates were enrolled in a program in December 1980, with an average faculty size of 12 members.[2] The 64 programs, listed in Table 8.1, represent 58 different universities. The University of Michigan (Ann Arbor), University of Minnesota, North Carolina State University (Raleigh), University of North Carolina (Chapel Hill), University of Pittsburgh, and Yale University each have one statistics program and one biomedical program (i.e., biostatistics, biometry, biomathematics, epidemiology, or public health) included in the assessment. All but nine of the programs were initiated prior to 1970. In addition to the 58 universities represented in this discipline, another 5 were initially identified as meeting the criteria[3] for inclusion in the assessment:

Dartmouth College
University of Illinois--Chicago Circle
New York University
University of Northern Colorado
University of South Carolina

Statistics/biostatistics programs at these five institutions have not been included in the evaluations in this discipline, since in each case the study coordinator either indicated that the institution did not at that time have a research-doctorate program in statistics/ biostatistics or failed to provide the information requested by the committee.

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[1] Data from the NRC's Survey of Earned Doctorates indicate that 1,038 research doctorates in statistics/biostatistics were awarded by U.S. universities between FY1976 and FY1980.

[2] See the reported means for measures 03 and 01 in Table 8.2.

[3] As mentioned in Chapter I, the primary criterion for inclusion was that a university had awarded at least 5 doctorates in statistics/ biostatistics during the FY1976-78 period.

Before examining the individual program results presented in Table 8.1, the reader is urged to refer to Chapter II, in which each of the 16 measures used in the assessment is discussed. Summary statistics describing every measure are given in Table 8.2. For nine of the measures, data are reported for at least 61 of the 64 statistics/ biostatistics programs. For measures 04-07, which pertain to characteristics of the program graduates, data are presented for only 36 of the programs; the other 28 had too few graduates on which to base statistics.[4] For measure 12, a composite index of the size of a university library, data are available for 50 programs; for measure 13, the fraction of faculty with research support from the National Science Foundation, the National Institutes of Health, or the Alcohol, Drug Abuse, and Mental Health Administration, data are reported for 37 programs that had at least 10 faculty members. As mentioned in Chapter II, data are not available on total university expenditures for research in the area of statistics and biostatistics--measure 14.

Intercorrelations among the 15 measures (Pearson product-moment coefficients) are given in Table 8.3. Of particular note are the high positive correlations of the measures of the numbers of faculty and doctoral graduates (01, 02) with measures of publication records (15, 16) and reputational survey ratings (08, 09, and 11). Figure 8.1 illustrates the relation between the mean rating of the scholarly quality of faculty (measure 08) and the number of faculty members (measure 01) for each of the 63 statistics/biostatistics programs. Figure 8.2 plots the mean rating of program effectiveness (measure 09) against the total number of FY1976-80 program graduates (measure 02). Although in both figures there is a significant positive correlation between program size and reputational rating, it is quite apparent that some of the smaller programs received high mean ratings and some of the larger programs received low mean ratings.

Table 8.4 describes the 135 faculty members who participated in the evaluation of statistics/biostatistics programs. These individuals constituted 71 percent of those asked to respond to the survey in this discipline and 17 percent of the faculty population in the 64 research-doctorate programs being evaluated.[5] More than one-third of the survey participants were mathematical statisticians and 16 percent were biostatisticians. More than half of them held the rank of full professor; almost two-thirds had earned their highest degree prior to 1970.

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[4] As mentioned in Chapter II, data for measures 04-07 are not reported if they are based on the survey responses of fewer than 10 FY1975-79 program graduates.

[5] See Table 2.3 in Chapter II.

Two exceptions should be noted with regard to the survey evaluations in this discipline. The biostatistics program in the School of Public Health at the University of Michigan (Ann Arbor) was omitted on the survey form because at the time of the survey mailing no information on this program had been provided by the institution. At the request of the study coordinator at this university, the program has been included in all other aspects of the assessment. Shortly after the survey mailing it was called to the committee's attention that the name of a faculty member in the statistics program at the University of Rochester was not included on the survey form. The department chairman at this university contacted other department chairmen in the discipline informing them of this omission.

To assist the reader in interpreting results of the survey evaluations, estimated standard errors have been computed for mean ratings of the scholarly quality of faculty in 63 statistics/biostatistics programs (and are given in Table 8.1). For each program the mean rating and an associated "confidence interval" of 1.5 standard errors are illustrated in Figure 8.3 (listed in order of highest to lowest mean rating). In comparing two programs, if their confidence intervals do not overlap, one may conclude that there is a significant difference in their mean ratings at a .05 level of significance.[6] From this figure it is also apparent that one should have somewhat more confidence in the accuracy of the mean ratings of higher-rated programs than lower-rated programs. This generalization results primarily from the fact that evaluators are not as likely to be familiar with the less prestigious programs, and consequently the mean ratings of these programs are usually based on fewer survey responses.

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[6] See pp. 29-31 for a discussion of the interpretation of mean ratings and associated confidence intervals.

TABLE 8.1 Program Measures (Raw and Standardized Values) in Statistics/Biostatistics

Prog No.	University - Department/Academic Unit	Program Size			Characteristics of Program Graduates			
		(01)	(02)	(03)	(04)	(05)	(06)	(07)
001.	American University	6	12	21	NA	NA	NA	NA
	Mathematics, Statistics, and Computer Sci	*40*	*47*	*50*				
002.	Boston University	6	9	15	NA	NA	NA	NA
	Mathematics	*40*	*44*	*46*				
003.	California, University of-Berkeley	24	50	69	.12	6.3	.80	.43
	Statistics	*68*	*85*	*75*	*40*	*53*	*52*	*50*
004.	California, University of-Los Angeles	19	15	27	.63	6.5	.67	.50
	Public Health/Mathematics	*60*	*50*	*53*	*65*	*51*	*40*	*55*
005.	California, University of-Riverside	9	13	21	NA	NA	NA	NA
	*Statistics**	*45*	*48*	*50*				
006.	Carnegie-Mellon University	14	7	23	NA	NA	NA	NA
	Statistics	*52*	*42*	*51*				
007.	Case Western Reserve University	9	NA	3	NA	NA	NA	NA
	*Biometry**	*45*		*40*				
008.	Chicago, University of	12	11	7	.50	6.0	NA	NA
	Statistics	*49*	*46*	*42*	*59*	*55*		
009.	Colorado State University-Fort Collins	15	12	13	NA	NA	NA	NA
	Statistics	*54*	*47*	*45*				
010.	Columbia University	17	17	34	.19	6.5	.80	.47
	Mathematical Statistics	*57*	*52*	*57*	*44*	*51*	*52*	*53*
011.	Connecticut, University of-Storrs	8	2	9	NA	NA	NA	NA
	Statistics	*43*	*37*	*43*				
012.	Cornell University-Ithaca	24	3	8	.32	5.3	.96	.55
	Statistics	*68*	*38*	*43*	*50*	*61*	*66*	*59*
013.	Delaware, University of-Newark	6	NA	8	NA	NA	NA	NA
	*Applied Sciences**	*40*		*43*				
014.	Florida State University-Tallahassee	14	28	38	.55	6.7	.77	.57
	Statistics	*52*	*63*	*59*	*61*	*50*	*49*	*60*
015.	Florida, University of-Gainesville	18	8	39	.09	5.0	.73	.46
	Statistics	*58*	*43*	*59*	*39*	*63*	*45*	*52*
016.	George Washington University	3	12	42	.33	12.0	.67	.08
	Statistics	*36*	*47*	*61*	*51*	*8*	*40*	*24*
017.	Georgia, University of-Athens	7	22	15	.10	8.5	.81	.29
	Statistics and Computer Science	*42*	*57*	*46*	*39*	*36*	*53*	*39*
018.	Harvard University	7	16	14	.50	6.1	.94	.59
	Statistics	*42*	*51*	*46*	*59*	*54*	*64*	*62*
019.	Illinois, University-Urbana/Champaign	13	1	3	NA	NA	NA	NA
	Mathematics	*51*	*36*	*40*				
020.	Indiana University-Bloomington	2	6	9	.20	6.0	.70	.60
	Mathematics	*34*	*41*	*43*	*44*	*55*	*43*	*63*

* indicates program was initiated since 1970.

NOTE: On the first line of data for every program, raw values for each measure are reported; on the second line values are reported in standardized form, with mean = 50 and standard deviation = 10. "NA" indicates that the value for a measure is not available.

TABLE 8.1 Program Measures (Raw and Standardized Values) in Statistics/Biostatistics

Prog No.	Survey Results				University Library	Research Support		Published Articles		Survey Ratings Standard Error			
	(08)	(09)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(08)	(09)	(10)	(11)
001.	0.9	0.4	0.9	0.2	NA	NA	NA	0		.12	.10	.10	.04
	30	*28*	*45*	*31*				*39*	*40*				
002.	1.4	0.8	1.0	0.4	-0.4	NA	NA	2		.14	.13	.07	.06
	35	*37*	*48*	*38*	*42*			*40*	*43*				
003.	4.9	2.6	1.3	1.8	2.2	.54	NA	52		.04	.06	.06	.04
	72	*70*	*59*	*70*	*65*	*66*		*86*	*87*				
004.	3.7	2.0	1.1	1.3	2.0	.32	NA	3		.08	.06	.06	.06
	59	*58*	*52*	*58*	*63*	*53*		*41*	*41*				
005.	2.4	1.3	1.6	0.8	-1.0	NA	NA	4		.08	.08	.08	.06
	46	*46*	*69*	*47*	*36*			*42*	*43*				
006.	3.5	2.0	1.6	1.3	NA	.29	NA	9		.07	.06	.06	.06
	57	*58*	*71*	*58*		*52*		*47*	*46*				
007.	1.6	0.9	0.6	0.4	-1.3	NA	NA	0		.14	.11	.12	.06
	37	*37*	*34*	*36*	*33*			*39*	*40*				
008.	4.7	2.3	1.2	1.5	0.9	.42	NA	25		.05	.06	.05	.06
	70	*65*	*56*	*65*	*53*	*59*		*61*	*58*				
009.	3.2	1.9	1.1	1.2	-1.1	.33	NA	15		.07	.06	.06	.06
	54	*56*	*52*	*55*	*35*	*54*		*52*	*49*				
010.	3.8	2.0	1.0	1.3	1.7	.47	NA	16		.07	.06	.07	.07
	61	*58*	*48*	*59*	*61*	*62*		*53*	*57*				
011.	2.1	1.1	1.0	0.9	-0.5	NA	NA	3		.10	.10	.06	.06
	43	*42*	*49*	*49*	*41*			*41*	*41*				
012.	4.0	2.2	1.0	1.5	1.6	.25	NA	30		.08	.07	.07	.06
	62	*62*	*48*	*63*	*60*	*50*		*66*	*66*				
013.	1.8	0.7	1.3	0.6	NA	NA	NA	8		.13	.10	.10	.06
	39	*34*	*57*	*41*				*46*	*46*				
014.	3.8	2.2	1.0	1.4	-0.4	.14	NA	18		.07	.05	.07	.06
	61	*62*	*48*	*61*	*41*	*44*		*55*	*55*				
015.	2.4	1.4	1.1	0.9	0.8	.00	NA	23		.09	.08	.08	.06
	45	*47*	*53*	*49*	*52*	*36*		*60*	*56*				
016.	2.6	1.3	0.4	1.0	NA	NA	NA	3		.11	.09	.07	.06
	48	*46*	*26*	*51*				*41*	*41*				
017.	1.7	1.0	1.1	0.7	0.4	NA	NA	11		.11	.09	.10	.06
	39	*39*	*52*	*44*	*49*			*49*	*46*				
018.	4.0	1.9	1.0	1.4	3.0	NA	NA	13		.08	.06	.06	.05
	62	*56*	*49*	*62*	*73*			*50*	*49*				
019.	3.4	1.6	1.2	1.0	2.0	.46	NA	20		.11	.11	.06	.07
	57	*50*	*53*	*51*	*63*	*62*		*37*	*64*				
020.	1.7	0.8	0.6	0.9	0.9	NA	NA	10		.15	.10	.08	.07
	39	*36*	*34*	*49*	*54*			*48*	*49*				

NOTE: On the first line of data for every program, raw values for each measure are reported; on the second line values are reported in standardized form, with mean = 50 and standard deviation = 10. "NA" indicates that the value for a measure is not available. Since the scale used to compute measure (16) is entirely arbitrary, only values in standardized form are reported for this measure.

TABLE 8.1 Program Measures (Raw and Standardized Values) in Statistics/Biostatistics

Prog No.	University - Department/Academic Unit	Program Size (01)	(02)	(03)	Characteristics of Program Graduates (04)	(05)	(06)	(07)
021.	Iowa State University-Ames *Statistics*	19 *60*	38 *73*	40 *60*	.16 *42*	6.5 *51*	.84 *55*	.36 *45*
022.	Iowa, University of-Iowa City *Statistics*	13 *51*	13 *48*	15 *46*	.40 *54*	6.5 *51*	.60 *34*	.30 *41*
023.	Johns Hopkins University *Biostatistics*	9 *45*	15 *50*	10 *44*	.82 *75*	7.0 *48*	.82 *54*	.47 *53*
024.	Kansas State University-Manhattan *Statistics*	13 *51*	12 *47*	12 *45*	.21 *45*	7.5 *44*	.71 *44*	.36 *45*
025.	Kentucky, University of *Statistics*	9 *45*	16 *51*	19 *49*	.27 *48*	6.3 *53*	.80 *52*	.40 *48*
026.	Maryland, University of-College Park *Mathematics**	8 *43*	5 *40*	14 *46*	NA	NA	NA	NA
027.	Michigan State University-East Lansing *Statistics and Probability*	15 *54*	12 *47*	14 *46*	NA	NA	NA	NA
028.	Michigan, University of-Ann Arbor *Biostatistics (School of Public Health)*	13 *51*	11 *46*	28 *53*	NA	NA	NA	NA
029.	Michigan, University of-Ann Arbor *Statistics*	13 *51*	14 *49*	20 *49*	.36 *52*	6.0 *55*	1.00 *70*	.55 *59*
030.	Minnesota, University of *Biometry*	7 *42*	11 *46*	7 *42*	NA	8.0 *40*	.91 *61*	.46 *52*
031.	Minnesota, University of *Statistics*	15 *54*	12 *47*	12 *45*	.22 *45*	6.5 *51*	.72 *45*	.50 *55*
032.	Missouri, University of-Columbia *Statistics*	11 *48*	9 *44*	10 *44*	NA	NA	NA	NA
033.	Missouri, University of-Rolla *Statistics*	4 *37*	4 *39*	5 *41*	NA	NA	NA	NA
034.	New Mexico, University of-Albuquerque *Mathematics and Statistics*	8 *43*	10 *45*	6 *42*	NA	NA	NA	NA
035.	North Carolina State University-Raleigh *Biomathematics*	12 *49*	5 *40*	11 *44*	NA	NA	NA	NA
036.	North Carolina State University-Raleigh *Statistics*	31 *78*	19 *54*	32 *56*	.43 *55*	7.5 *44*	.86 *57*	.43 *50*
037.	North Carolina, University of-Chapel Hill *Biostatistics*	23 *66*	35 *70*	44 *62*	.62 *65*	7.0 *48*	.79 *50*	.43 *50*
038.	North Carolina, University of-Chapel Hill *Statistics*	15 *54*	22 *57*	23 *51*	.28 *48*	5.8 *57*	.72 *44*	.56 *60*
039.	Ohio State University-Columbus *Statistics/Biostatistics**	10 *46*	17 *52*	28 *53*	.00 *34*	5.4 *60*	.83 *55*	.44 *51*
040.	Oklahoma State University-Stillwater *Statistics*	9 *45*	19 *54*	20 *49*	.07 *38*	6.4 *52*	.67 *40*	.20 *33*

* indicates program was initiated since 1970.

NOTE: On the first line of data for every program, raw values for each measure are reported; on the second line values are reported in standardized form, with mean = 50 and standard deviation = 10. "NA" indicates that the value for a measure is not available.

TABLE 8.1 Program Measures (Raw and Standardized Values) in Statistics/Biostatistics

Prog No.	Survey Results				University Library	Research Support		Published Articles		Survey Ratings Standard Error			
	(08)	(09)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(08)	(09)	(10)	(11)
021.	4.0	2.3	1.2	1.5	-0.5	.21	NA	29		.07	.06	.04	.06
	62	*64*	*53*	*64*	*41*	*48*		*65*	*60*				
022.	3.0	1.8	1.1	1.2	0.3	.08	NA	9		.08	.06	.06	.06
	52	*55*	*51*	*57*	*48*	*40*		*47*	*44*				
023.	2.8	1.7	0.9	0.7	-0.4	NA	NA	1		.10	.08	.06	.06
	50	*53*	*44*	*44*	*42*			*40*	*40*				
024.	1.8	1.2	1.0	0.4	NA	.00	NA	5		.10	.09	.09	.05
	40	*43*	*49*	*37*		*36*		*43*	*43*				
025.	2.6	1.4	1.0	1.1	-0.1	NA	NA	15		.08	.08	.09	.06
	48	*47*	*49*	*53*	*44*			*52*	*52*				
026.	1.6	0.7	1.1	0.4	0.2	NA	NA	7		.12	.10	.06	.06
	37	*34*	*52*	*38*	*47*			*45*	*49*				
027.	3.1	1.8	0.9	1.0	0.3	.60	NA	14		.08	.06	.05	.06
	53	*54*	*44*	*51*	*48*	*69*		*51*	*55*				
028.	NA	NA	NA	NA	1.8	.08	NA	2		NA	NA	NA	NA
					62	*40*		*40*	*41*				
029.	3.1	1.8	1.0	0.8	1.8	.39	NA	13		.09	.05	.07	.07
	53	*55*	*48*	*48*	*62*	*57*		*50*	*50*				
030.	2.2	1.2	1.0	0.4	1.2	NA	NA	4		.15	.12	.05	.06
	43	*44*	*46*	*36*	*56*			*42*	*43*				
031.	3.7	2.1	1.1	1.4	1.2	.53	NA	31		.07	.05	.06	.06
	60	*60*	*51*	*60*	*56*	*66*		*67*	*65*				
032.	2.3	1.4	0.9	0.7	-0.2	.27	NA	7		.09	.07	.04	.07
	44	*46*	*44*	*45*	*43*	*51*		*45*	*46*				
033.	1.5	0.7	1.0	0.5	NA	NA	NA	12		.15	.11	.12	.07
	36	*34*	*46*	*39*				*50*	*49*				
034.	2.1	1.3	0.9	0.6	-1.0	NA	NA	6		.10	.07	.10	.06
	43	*45*	*45*	*42*	*36*			*44*	*43*				
035.	2.4	1.4	0.7	0.3	NA	.08	NA	7		.17	.12	.11	.05
	45	*47*	*35*	*34*		*40*		*45*	*45*				
036.	3.1	1.9	0.9	1.0	NA	.10	NA	7		.10	.07	.05	.07
	53	*57*	*45*	*52*		*41*		*45*	*45*				
037.	3.7	2.2	1.1	1.3	1.0	.13	NA	4		.09	.07	.05	.07
	60	*62*	*52*	*59*	*54*	*43*		*42*	*43*				
038.	4.0	2.2	0.9	1.4	1.0	.27	NA	41		.07	.06	.06	.06
	63	*62*	*43*	*62*	*54*	*51*		*76*	*77*				
039.	2.5	1.6	1.1	1.0	0.9	.30	NA	19		.08	.07	.06	.06
	47	*50*	*51*	*51*	*53*	*53*		*56*	*56*				
040.	1.7	1.3	0.9	0.5	-1.9	NA	NA	3		.10	.08	.07	.06
	39	*46*	*45*	*40*	*27*			*41*	*42*				

NOTE: On the first line of data for every program, raw values for each measure are reported; on the second line values are reported in standardized form, with mean = 50 and standard deviation = 10. "NA" indicates that the value for a measure is not available. Since the scale used to compute measure (16) is entirely arbitrary, only values in standardized form are reported for this measure.

TABLE 8.1 Program Measures (Raw and Standardized Values) in Statistics/Biostatistics

Prog No.	University - Department/Academic Unit	Program Size (01)	Program Size (02)	Program Size (03)	Characteristics of Program Graduates (04)	Characteristics of Program Graduates (05)	Characteristics of Program Graduates (06)	Characteristics of Program Graduates (07)
041.	Oregon State University-Corvallis	16	17	20	.44	8.5	.63	.25
	Statistics	*55*	*52*	*49*	*56*	*36*	*36*	*37*
042.	Pennsylvania State University	13	15	16	.27	8.0	.80	.40
	Statistics	*51*	*50*	*47*	*47*	*40*	*52*	*48*
043.	Pennsylvania, University of	12	6	10	NA	NA	NA	NA
	Statistics	*49*	*41*	*44*				
044.	Pittsburgh, University of	8	6	16	NA	NA	NA	NA
	Biostatistics (Grad Schl of Public Health)	*43*	*41*	*47*				
045.	Pittsburgh, University of	9	3	20	NA	NA	NA	NA
	*Mathematics and Statistics**	*45*	*38*	*49*				
046.	Princeton University	7	13	17	.07	4.5	.86	.36
	Statistics	*42*	*48*	*48*	*38*	*67*	*57*	*45*
047.	Purdue University-West Lafayette	23	25	33	.04	6.2	.79	.58
	Statistics	*66*	*60*	*56*	*36*	*54*	*51*	*62*
048.	Rochester, University of	11	13	19	.15	7.8	1.00	.58
	Statistics	*48*	*48*	*49*	*42*	*42*	*70*	*62*
049.	Rutgers, The State University-New Brunswick	14	8	126	NA	NA	NA	NA
	Statistics	*52*	*43*	*99*				
050.	SUNY at Buffalo	7	15	8	.59	5.8	.71	.41
	Statistics	*42*	*50*	*43*	*63*	*57*	*43*	*49*
051.	SUNY at Stony Brook	5	17	36	NA	NA	NA	NA
	Applied Mathematics and Statistics	*39*	*52*	*58*				
052.	South Florida, University of-Tampa	3	NA	2	NA	NA	NA	NA
	*Mathematics**	*36*		*39*				
053.	Southern Methodist University	11	16	25	.39	5.5	.83	.56
	Statistics	*48*	*51*	*52*	*53*	*59*	*55*	*60*
054.	Stanford University	20	40	48	.57	5.9	.83	.53
	Statistics	*61*	*75*	*64*	*62*	*56*	*55*	*57*
055.	Temple University	16	12	36	NA	NA	NA	NA
	*Statistics**	*55*	*47*	*58*				
056.	Texas A & M University	18	25	25	.10	7.2	.91	.43
	Statistics	*58*	*60*	*52*	*39*	*46*	*61*	*50*
057.	Texas, U of-Health Science Center, Houston	14	2	2	NA	NA	NA	NA
	Biomathematics (M D Anderson Hospital)	*52*	*37*	*39*				
058.	Virginia Commonwealth University/Medical Col	5	8	5	NA	NA	NA	NA
	Biostatistics	*39*	*43*	*41*				
059.	Virginia Polytechnic Institute & State Univ	19	26	25	.30	7.5	.65	.30
	Statistics and Statistical Lab	*60*	*61*	*52*	*49*	*44*	*38*	*41*
060.	Washington, University of-Seattle	34	24	36	.70	7.0	.86	.64
	Biomathematics Group and Biostatistics	*83*	*59*	*58*	*68*	*48*	*57*	*66*

* indicates program was initiated since 1970.

NOTE: On the first line of data for every program, raw values for each measure are reported; on the second line values are reported in standardized form, with mean = 50 and standard deviation = 10. "NA" indicates that the value for a measure is not available.

TABLE 8.1 Program Measures (Raw and Standardized Values) in Statistics/Biostatistics

Prog	Survey Results				University Library	Research Support		Published Articles		Survey Ratings Standard Error			
No.	(08)	(09)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(08)	(09)	(10)	(11)
041.	2.8	1.7	1.0	0.8	NA	.13	NA	8		.08	.08	.05	.06
	50	*53*	*49*	*48*		*43*		*46*	*48*				
042.	2.7	1.6	1.1	1.0	0.7	.31	NA	13		.08	.06	.05	.07
	49	*52*	*52*	*52*	*52*	*53*		*50*	*51*				
043.	2.6	1.4	1.2	0.8	0.7	.00	NA	4		.09	.09	.06	.07
	47	*48*	*54*	*46*	*51*	*36*		*42*	*41*				
044.	1.9	1.0	1.0	0.3	0.1	NA	NA	0		.17	.14	.10	.05
	40	*39*	*46*	*34*	*46*			*39*	*40*				
045.	3.1	1.3	1.8	1.1	0.1	NA	NA	13		.10	.10	.05	.07
	53	*45*	*78*	*53*	*46*			*50*	*50*				
046.	4.0	1.9	0.9	1.5	0.9	NA	NA	11		.10	.08	.04	.05
	62	*56*	*43*	*65*	*53*			*49*	*45*				
047.	3.9	2.1	1.2	1.4	-0.5	.48	NA	26		.06	.06	.05	.05
	61	*60*	*56*	*61*	*40*	*63*		*62*	*62*				
048.	3.0	1.7	1.1	1.0	-0.6	.46	NA	18		.08	.07	.06	.07
	52	*53*	*50*	*52*	*39*	*61*		*55*	*54*				
049.	3.2	1.8	0.9	1.0	0.8	.50	NA	31		.09	.06	.08	.07
	54	*54*	*44*	*52*	*53*	*64*		*67*	*71*				
050.	1.9	1.1	0.1	0.7	0.3	NA	NA	7		.10	.09	.05	.07
	40	*42*	*15*	*44*	*48*			*45*	*44*				
051.	2.2	1.1	1.5	0.8	-0.6	NA	NA	3		.14	.13	.10	.07
	44	*42*	*66*	*46*	*39*			*41*	*41*				
052.	2.0	0.6	1.3	0.7	NA	NA	NA	2		.15	.10	.14	.07
	41	*32*	*59*	*44*				*40*	*43*				
053.	2.6	1.6	1.0	0.9	NA	.00	NA	13		.09	.06	.05	.06
	48	*51*	*48*	*50*		*36*		*50*	*49*				
054.	4.9	2.8	1.2	1.7	2.0	.35	NA	36		.04	.04	.05	.05
	72	*73*	*55*	*69*	*64*	*55*		*71*	*71*				
055.	1.8	1.1	1.0	0.5	-0.4	.00	NA	10		.10	.10	.07	.06
	39	*41*	*48*	*39*	*41*	*36*		*48*	*48*				
056.	3.1	1.8	1.4	1.3	-0.5	.06	NA	14		.07	.07	.08	.05
	53	*55*	*63*	*59*	*41*	*39*		*51*	*49*				
057.	2.4	1.3	1.2	0.4	NA	.29	NA	NA		.16	.12	.12	.06
	46	*45*	*57*	*37*		*52*			*NA*				
058.	1.1	0.8	0.8	0.3	NA	NA	NA	2		.12	.14	.13	.05
	33	*36*	*41*	*34*				*40*	*41*				
059.	2.9	1.8	1.2	1.1	-0.0	.05	NA	17		.09	.06	.05	.06
	51	*54*	*56*	*55*	*45*	*39*		*54*	*52*				
060.	3.8	2.2	1.8	1.1	1.5	.35	NA	9		.07	.07	.06	.07
	61	*62*	*77*	*55*	*59*	*56*		*47*	*48*				

NOTE: On the first line of data for every program, raw values for each measure are reported; on the second line values are reported in standardized form, with mean = 50 and standard deviation = 10. "NA" indicates that the value for a measure is not available. Since the scale used to compute measure (16) is entirely arbitrary, only values in standardized form are reported for this measure.

TABLE 8.1 Program Measures (Raw and Standardized Values) in Statistics/Biostatistics

Prog No.	University - Department/Academic Unit	Program Size (01)	(02)	(03)	Characteristics of Program Graduates (04)	(05)	(06)	(07)
061.	Wisconsin, University of-Madison	23	41	40	.21	5.7	.67	.29
	Statistics	*66*	*76*	*60*	*45*	*58*	*40*	*40*
062.	Wyoming, University of	7	9	9	NA	NA	NA	NA
	*Statistics**	*42*	*44*	*43*				
063.	Yale University	6	9	6	NA	NA	NA	NA
	Epidemiology and Public Health	*40*	*44*	*42*				
064.	Yale University	6	13	18	.30	6.5	.50	.10
	Statistics	*40*	*48*	*48*	*49*	*51*	*25*	*26*

* indicates program was initiated since 1970.

NOTE: On the first line of data for every program, raw values for each measure are reported; on the second line values are reported in standardized form, with mean = 50 and standard deviation = 10. "NA" indicates that the value for a measure is not available.

TABLE 8.1 Program Measures (Raw and Standardized Values) in Statistics/Biostatistics

Prog No.	Survey Results				University Library	Research Support		Published Articles		Survey Ratings Standard Error			
	(08)	(09)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(08)	(09)	(10)	(11)
061.	4.3	2.4	1.2	1.6	1.6	.22	NA	35		.06	.05	.05	.05
	66	*67*	*54*	*67*	*59*	*48*		*70*	*70*				
062.	1.9	1.1	1.0	0.5	NA	NA	NA	7		.10	.10	.04	.06
	40	*41*	*48*	*40*				*45*	*41*				
063.	2.0	1.4	1.1	0.4	2.1	NA	NA	2		.16	.13	.08	.06
	42	*47*	*51*	*37*	*64*			*40*	*41*				
064.	3.7	2.0	1.0	1.3	2.1	NA	NA	5		.08	.06	.04	.07
	60	*57*	*46*	*60*	*64*			*43*	*46*				

NOTE: On the first line of data for every program, raw values for each measure are reported; on the second line values are reported in standardized form, with mean = 50 and standard deviation = 10. "NA" indicates that the value for a measure is not available. Since the scale used to compute measure (16) is entirely arbitrary, only values in standardized form are reported for this measure.

TABLE 8.2 Summary Statistics Describing Each Program Measure--Statistics/Biostatistics

Measure	Number of Programs Evaluated	Mean	Standard Deviation	DECILES								
				1	2	3	4	5	6	7	8	9
Program Size												
01 Raw Value	64	12	7	5	7	8	9	12	13	15	17	22
Std Value	64	50	10	39	42	43	45	49	51	54	57	65
02 Raw Value	61	15	10	4	7	9	12	13	15	16	19	26
Std Value	61	50	10	39	42	44	47	48	50	51	54	61
03 Raw Value	64	22	19	5	8	10	14	17	20	25	33	40
Std Value	64	50	10	41	43	44	46	48	49	52	56	60
Program Graduates												
04 Raw Value	36	.32	.20	.07	.10	.18	.22	.28	.33	.41	.50	.60
Std Value	36	50	10	38	39	43	45	48	51	55	59	64
05 Raw Value	37	6.7	1.3	8.2	7.5	7.0	6.5	6.5	6.3	6.0	5.8	5.5
Std Value	37	50	10	38	44	48	51	51	53	55	57	59
06 Raw Value	36	.78	.11	.64	.67	.71	.74	.80	.81	.83	.86	.92
Std Value	36	50	10	37	40	44	46	52	53	55	57	63
07 Raw Value	36	.43	.13	.23	.30	.36	.42	.43	.46	.51	.55	.58
Std Value	36	50	10	35	40	45	49	50	52	56	59	62
Survey Results												
08 Raw Value	63	2.8	1.0	1.6	1.8	2.1	2.4	2.7	3.1	3.2	3.8	4.0
Std Value	63	50	10	37	40	43	46	49	53	54	61	63
09 Raw Value	63	1.6	.5	.8	1.1	1.3	1.4	1.6	1.8	1.9	2.0	2.2
Std Value	63	50	10	36	41	45	47	51	55	56	58	62
10 Raw Value	63	1.1	.3	.8	.9	1.0	1.0	1.0	1.1	1.1	1.2	1.3
Std Value	63	50	10	40	44	48	48	48	52	52	55	59
11 Raw Value	63	.9	.4	.4	.5	.7	.8	1.0	1.0	1.2	1.3	1.5
Std Value	63	50	10	37	40	44	47	52	52	57	59	64
University Library												
12 Raw Value	50	.5	1.1	-1.0	-.5	-.4	.1	.4	.9	1.0	1.6	2.0
Std Value	50	50	10	36	40	41	46	49	53	54	60	64
Research Support												
13 Raw Value	37	.25	.18	.00	.06	.10	.20	.27	.30	.35	.44	.49
Std Value	37	50	10	36	39	42	47	51	53	56	61	63
Publication Records												
15 Raw Value	63	12	11	2	3	5	7	9	13	14	18	30
Std Value	63	50	10	41	41	43	45	47	50	51	55	66
16 Std Value	63	50	10	41	41	43	45	47	49	51	56	65

NOTE: Standardized values reported in the preceding table have been computed from exact values of the mean and standard deviation and not the rounded values reported here. Since the scale used to compute measure 16 is entirely arbitrary, only data in standardized form are reported for this measure.

TABLE 8.3 Intercorrelations Among Program Measures on 64 Programs in Statistics/Biostatistics

	Measure															
	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16
Program Size																
01		.53	.42	.16	.15	.16	.29	.63	.72	.35	.54	.24	.05	N/A	.50	.49
02			.48	.00	.04	.00	-.03	.55	.63	.17	.59	.11	.06	N/A	.52	.48
03				-.07	-.05	-.03	-.03	.40	.42	.12	.40	.14	.17	N/A	.48	.50
Program Graduates																
04					-.11	-.02	.22	.19	.24	-.06	.00	.24	-.11	N/A	-.32	-.29
05						.14	.45	.32	.30	.15	.35	.25	.11	N/A	.39	.37
06							.62	.15	.13	.24	.04	.06	.31	N/A	.14	.11
07								.25	.24	.26	.17	.20	.44	N/A	.28	.30
Survey Results																
08									.95	.30	.93	.53	.53	N/A	.70	.67
09										.24	.87	.45	.41	N/A	.67	.63
10											.27	.04	.09	N/A	.16	.15
11												.43	.38	N/A	.71	.66
University Library																
12													.26	N/A	.32	.36
Research Support																
13														N/A	.48	.56
14															N/A	N/A
Publication Records																
15																.98
16																

NOTE: Since in computing correlation coefficients program data must be available for both of the measures being correlated, the actual number of programs on which each coefficient is based varies.

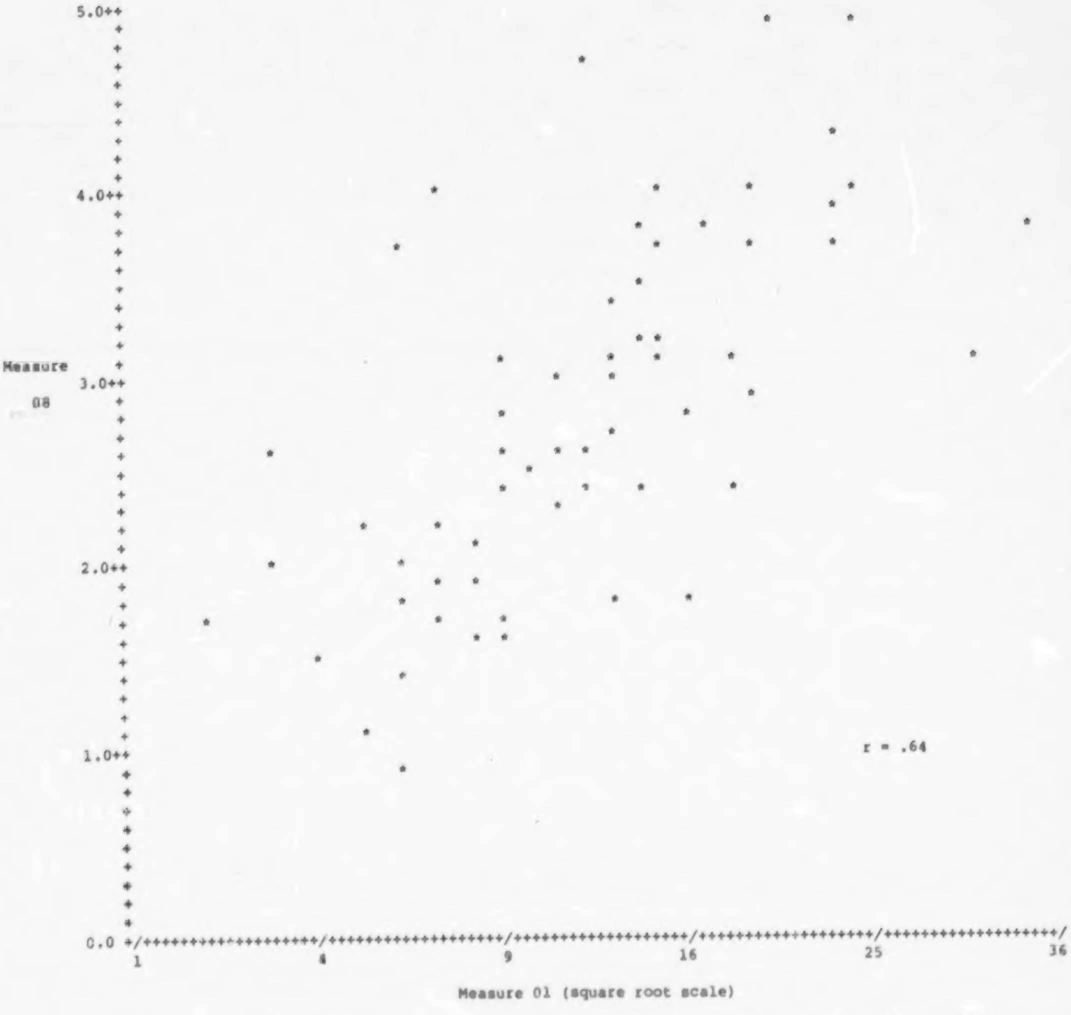

FIGURE 8.1 Mean rating of scholarly quality of faculty (measure 08) versus number of faculty members (measure 01)--63 programs in statistics/biostatistics.

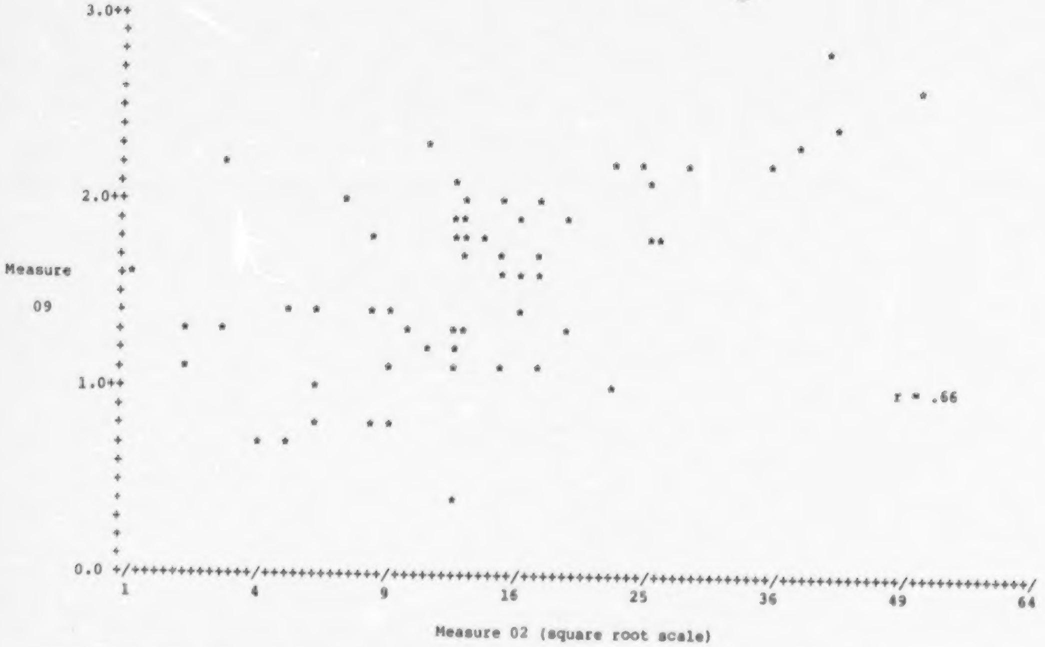

FIGURE 8.2 Mean rating of program effectiveness in educating research scholars/scientists (measure 09) versus number of graduates in last five years (measure 02)--60 programs in statistics/biostatistics.

TABLE 8.4 Characteristics of Survey Participants in Statistics/Biostatistics

	Respondents	
	N	%
Field of Specialization		
Biostatistics/Biometrics	22	16
Mathematical Statistics	51	38
Statistics, General	48	36
Other/Unknown	14	10
Faculty Rank		
Professor	78	58
Associate Professor	32	24
Assistant Professor	24	18
Other/Unknown	1	1
Year of Highest Degree		
Pre-1950	3	2
1950-59	28	21
1960-69	55	41
Post-1969	47	35
Unknown	2	2
Evaluator Selection		
Nominated by Institution	112	83
Other	23	17
Survey Form		
With Faculty Names	119	88
Without Names	16	12
Total Evaluators	135	100

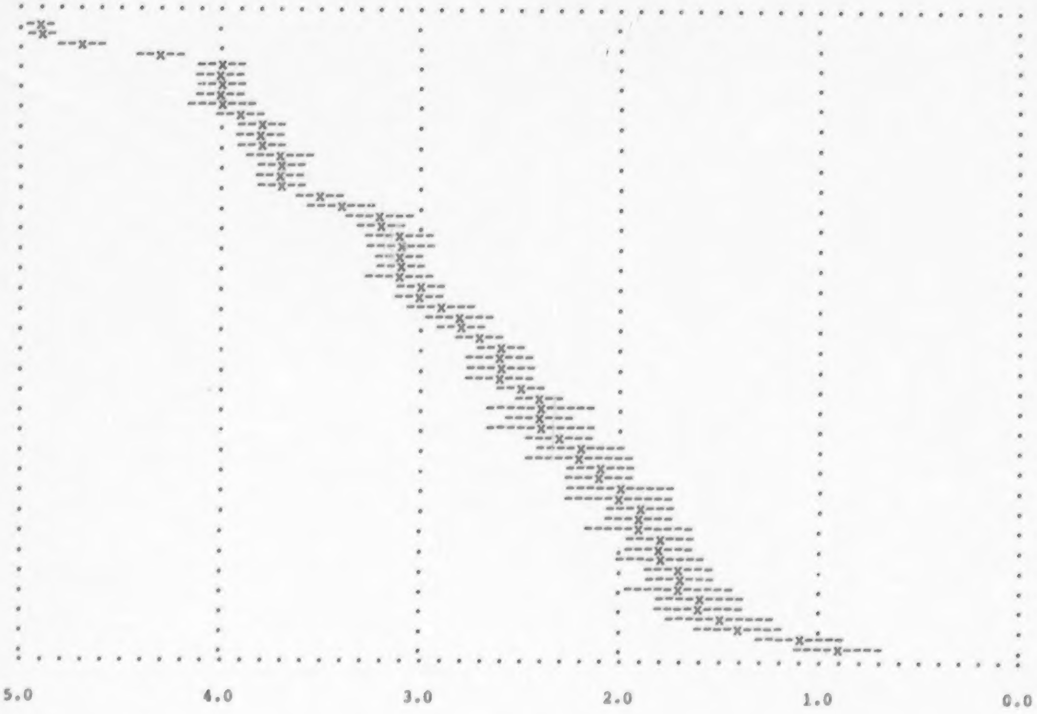

FIGURE 8.3 Mean rating of scholarly quality of faculty in 63 programs in statistics/biostatistics.

NOTE: Programs are listed in sequence of mean rating, with the highest-rated program appearing at the top of the page. The broken lines (---) indicate a confidence interval of ±1.5 standard errors around the reported mean (x) of each program.

IX
Summary and Discussion

In the six preceding chapters results are presented of the assessment of 596 research-doctorate programs in chemistry, computer sciences, geosciences, mathematics, physics, and statistics/biostatistics. Included in each chapter are summary data describing the means and intercorrelations of the program measures in a particular discipline. In this chapter a comparison is made of the summary data reported for the six disciplines. Also presented are an analysis of the reliability (consistency) of the reputational survey ratings and an examination of some factors that might possibly have influenced the survey results. This chapter concludes with suggestions for improving studies of this kind--with particular attention given to the types of measures one would like to have available for an assessment of research-doctorate programs.

This chapter necessarily involves a detailed discussion of various statistics (means, standard deviations, correlation coefficients) describing the measures. Throughout, the reader should bear in mind that all these statistics and measures are necessarily imperfect attempts to describe the real quality of research-doctorate programs. Quality and some differences in quality are real, but these differences cannot be subsumed completely under any one quantitative measure. For example, no single numerical ranking--by measure 08 or by any weighted average of measures--can rank the quality of different programs with precision.

However, the evidence for reliability indicates considerable stability in the assessment of quality. For instance, a program that comes out in the first decile of a ranking is quite unlikely to "really" belong in the third decile, or vice versa. If numerical ranks of programs were replaced by groupings (distinguished, strong, etc.), these groupings again would not fully capture actual differences in quality since there would likely be substantial ambiguity about the borderline between adjacent groups. Furthermore, any attempt at linear ordering (best, next best, . . .) also may be inaccurate. Programs of roughly comparable quality may be better in different ways, so that there simply is no one best program--as will also be indicated in some of the numerical analyses. However, these difficulties of formulating ranks should not hide the underlying reality of differences in quality or the importance of high quality for effective doctoral education.

SUMMARY OF THE RESULTS

Displayed in Table 9.1 are the numbers of programs evaluated (bottom line) and the mean values for each measure in the six mathematical and physical science disciplines.[1] As can be seen, the mean values reported for individual measures vary considerably among disciplines. The pattern of means on each measure is summarized below, but the reader interested in a detailed comparison of the distribution of a measure should refer to the second table in each of the preceding six chapters.[2]

Program Size (Measures 01-03). Based on the information provided to the committee by the study coordinator at each university, mathematics programs had, on the average, the largest number of faculty members (33 in December 1980), followed by physics (28) and chemistry (23). Chemistry programs graduated the most students (51 Ph.D. recipients in the FY1975-79 period) and had the largest enrollment (75 doctoral students in December 1980). In contrast, statistics and biostatistics programs were reported to have an average of only 12 faculty members, 15 graduates, and 22 doctoral students.

Program Graduates (Measures 04-07). The mean fraction of FY1975-79 doctoral recipients who as graduate students had received some national fellowship or training grant support (measure 04) ranges from .17 for graduates of computer science programs to .32 for graduates in statistics/biostatistics. (The relatively high figure for the latter group may be explained by the availability of National Institutes of Health (NIH) training grant support for students in biostatistics.) With respect to the median number of years from first enrollment in a graduate program to receipt of the doctorate (measure 05), chemistry graduates typically earned their degrees more than half a year sooner than graduates in any of the other disciplines. Graduates in physics and geosciences report the longest median times to the Ph.D. In terms of employment status at graduation (measure 06), an average of 80 percent of the Ph.D. recipients from computer science programs reported that they had made firm job commitments by the time they had completed the requirements for their degrees, contrasted with 61 percent of the program graduates in mathematics. A mean of 43 percent of the statistics/biostatistics graduates reported that they had made

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[1] Means for measure 16, "influence" of publication, are omitted since arbitrary scaling of this measure prevents meaningful comparisons across disciplines.

[2] The second table in each of the six preceding chapters presents the standard deviation and decile values for each measure.

TABLE 9.1 Mean Values for Each Program Measure, by Discipline

	Chemistry	Computer Sciences	Geo-sciences	Math	Physics	Statistics/ Biostat.
Program Size						
01	23	16	16	33	28	12
02	51	20	19	24	35	15
03	75	41	25	35	56	22
Program Graduates						
04	.23	.17	.26	.25	.26	.32
05	5.9	6.5	7.0	6.6	7.1	6.7
06	.76	.80	.77	.61	.66	.78
07	.33	.38	.22	.25	.26	.43
Survey Results						
08	2.5	2.5	2.9	2.7	2.7	2.8
09	1.6	1.5	1.8	1.6	1.7	1.6
10	1.1	1.1	1.1	1.2	1.1	1.1
11	.9	.9	.9	.8	.7	.9
University Library						
12	.1	.4	.4	.1	.1	.5
Research Support						
13	.48	.36	.47	.32	.36	.25
14	1788	1171	3996	616	2943	NA
Publication Records						
15	78	34	44	39	106	12
Total Programs	145	58	91	115	123	64

firm commitments to take positions in Ph.D.-granting institutions (measure 07), while only 22 percent of those in the geosciences had made such plans. This difference may be due, to a great extent, to the availability of employment opportunities for geoscientists outside the academic sector.

Survey Results (Measures 08-11). Differences in the mean ratings derived from the reputational survey are small. In all six disciplines the mean rating of scholarly quality of program faculty (measure 08) is slightly below 3.0 ("good"), and programs were judged to be, on the average, a bit below "moderately" effective (2.0) in educating research scholars/scientists (measure 09). In the opinions of the survey respondents, there has been "little or no change" (approximately 1.0 on measure 10) in the last five years in the overall average quality of programs. The mean rating of an evaluator's familiarity with the work of program faculty (measure 11) is close to 1.0 ("some familiarity") in every discipline--about which more will be said later in this chapter.

University Library (Measure 12). Measure 12, based on a composite index of the size[3] of the library at the university in which a program resides, is calculated on a scale from -2.0 to 3.0, with means ranging from .1 in chemistry, mathematics, and physics to .4 in computer sciences and geosciences, and .5 in statistics/biostatistics. These differences may be explained, in large part, by the number of programs evaluated in each discipline. In the disciplines with the fewest doctoral programs (statistics/biostatistics, computer sciences, and geosciences), programs included are typically found in the larger institutions, which are likely to have high scores on the library size index. Ph.D. programs in chemistry, physics, and mathematics are found in a much broader spectrum of universities that includes the smaller institutions as well as the larger ones.

Research Support (Measures 13-14). Measure (13), the proportion of program faculty who had received NSF, NIH, or ADAMHA[4] research grant awards during the FY1978-80 period, has mean values ranging from as high as .48 and .47 in chemistry and geosciences, respectively, to .25 in statistics/biostatistics. It should be emphasized that this measure does not take into account research support that faculty members have received from sources other than these three federal agencies. In terms of total university expenditures for R&D in a particular discipline (measure 14), the mean values are reported to range from $616,000 in mathematics to $3,996,000 in the geosciences. (R&D expenditure data are not available for statistics/biostatistics.) The large differences in reported expenditures are likely to be related to three factors: the differential availability of research support in the six disciplines, the differential average cost of doing research, and the differing numbers of individuals involved in a research effort.

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[3] The index, derived by the Association of Research Libraries, reflects a number of different measures, including number of volumes, fiscal expenditures, and other factors relevant to the size of a university library. See the description of this measure presented in Appendix D.

[4] Very few faculty members in mathematical and physical science programs received any research support from the Alcohol, Drug Abuse, and Mental Health Administration.

Publication Records (Measures 15 and 16). Considerable diversity is found in the mean number of articles associated with a research-doctorate program (measure 15). An average of 106 articles published in the 1978-79 period is reported for programs in physics and 75 articles for programs in chemistry; in each of the other four disciplines the mean number of articles is fewer than 40. These large differences reflect both the program size in a particular discipline (i.e., the total number of faculty and other staff members involved in research) and the frequency with which scientists in that discipline publish; it may also depend on the length of a typical paper in a discipline. Mean scores are not reported on measure 16, the estimated "overall influence" of the articles attributed to a program. Since this measure is calculated from an average of journal influence weights,[5] normalized for the journals covered in a particular discipline, mean differences among disciplines are uninterpretable.

Correlations with Measure 02. Relations among the program measures are of intrinsic interest and are relevant to the issue of validity of the measures as indices of the quality of a research-doctorate program. Measures that are logically related to program quality are expected to be related to each other. To the extent that they are, a stronger case might be made for the validity of each as a quality measure.

A reasonable index of the relationship between any two measures is the Pearson product-moment correlation coefficient. A table of correlation coefficients between all possible pairs of measures has been presented in each of the six preceding chapters. In this chapter selected correlations to determine the extent to which coefficients are comparable in the six disciplines are presented. Special attention is given to the correlations involving the number of FY1975-79 program graduates (measure 02), the survey rating of the scholarly quality of program faculty (measure 08), university R&D expenditures in a particular discipline (measure 14), and the influence-weighted number of publications (measure 16).

Table 9.2 presents the correlations of measure 02 with each of the other measures used in the assessment. As might be expected, correlations of this measure with the other two measures of program size--number of faculty (01) and doctoral student enrollment (03)--are

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[5] See Appendix F for a description of the derivation of this measure.

TABLE 9.2 Correlations of the Number of Program Graduates (Measure 02) with Other Measures, by Discipline

	Chemistry	Computer Sciences	Geo-sciences	Math	Physics	Statistics/ Biostat.
Program Size						
01	.68	.62	.42	.50	.77	.53
03	.92	.52	.72	.85	.92	.48
Program Graduates						
04	.02	.05	-.01	.08	-.02	.00
05	.38	-.07	.29	.31	.32	.04
06	.23	.12	.05	.18	.40	.00
07	.13	-.05	.36	.46	.41	-.03
Survey Results						
08	.83	.66	.64	.70	.76	.55
09	.81	.68	.67	.68	.73	.63
10	.23	-.02	.06	.01	-.17	.17
11	.83	.61	.67	.72	.78	.59
University Library						
12	.61	.44	.43	.45	.47	.11
Research Support						
13	.57	.34	.40	.35	.13	.06
14	.72	.58	.25	.41	.66	N/A
Publication Records						
15	.83	.85	.73	.75	.85	.52
16	.86	.84	.74	.81	.86	.48

quite high in all six disciplines. Of greater interest are the strong positive correlations between measure 02 and measures derived from either reputational survey ratings or publication records. The coefficients describing the relationship of measure 02 with measures 15 and 16 are greater than .70 in all disciplines except statistics/biostatistics. This result is not surprising, of course, since both of the publication measures reflect total productivity and have not been adjusted for program size. The correlations of measure 02 with measures 08, 09, and 11 are almost as strong. It is quite apparent that the programs that received high survey ratings and with which evaluators were more likely to be familiar were also ones that had larger numbers of graduates. Although the committee gave serious consideration to presenting an alternative set of survey measures that were adjusted for program size, a satisfactory algorithm for making such an adjustment was not found. In attempting such an adjustment on the basis of the regression of survey ratings on measures of program size, it was found that some exceptionally large programs appeared to be unfairly penalized and that some very small programs received unjustifiably high adjusted scores.

Measure 02 also has positive correlations in most disciplines with measure 12, an index of university library size, and with measures 13 and 14, which pertain to the level of support for research in a program. Of particular note are the moderately large coefficients--in disciplines other than statistics/biostatistics and physics--for measure 13, the fraction of faculty members receiving federal research grants. Unlike measure 14, this measure has been adjusted for the number of program faculty. The correlations of measure 02 with measures 05, 06, and 07 are smaller but still positive in most of the disciplines. From this analysis it is apparent that the number of program graduates tends to be positively correlated with all other variables except measure 04--the fraction of students with national fellowship support. It is also apparent that the relationship of measure 02 with the other variables tends to be weakest for programs in statistics/biostatistics.

Correlations with Measure 08. Table 9.3 shows the correlation coefficients for measure 08, the mean rating of the scholarly quality of program faculty, with each of the other variables. The correlations of measure 08 with measures of program size (01, 02, and 03) are .40 or greater for all six disciplines. Not surprisingly, the larger the program, the more likely its faculty is to be rated high in quality. However, it is interesting to note that in all disciplines except statistics/biostatistics the correlation with the number of program graduates (measure 02) is larger than that with the number of faculty or the number of enrolled students.

Correlations of measure 08 with measure 04, the fraction of students with national fellowship awards, are positive but close to zero in all disciplines except computer sciences and mathematics. For programs in the biological and social sciences, the corresponding coefficients (not reported in this volume) are found to be greater, typically in the range of .40 to .70. Perhaps in the mathematical and

TABLE 9.3 Correlations of the Survey Ratings of Scholarly Quality of Program Faculty (Measure 08) with Other Measures, by Discipline

	Chemistry	Computer Sciences	Geo-sciences	Math	Physics	Statistics/ Biostat.
Program Size						
01	.64	.54	.45	.48	.68	.63
02	.83	.66	.64	.70	.76	.55
03	.81	.50	.61	.64	.75	.40
Program Graduates						
04	.11	.35	.08	.30	.15	.19
05	.47	.14	.50	.57	.42	.32
06	.28	.21	.24	.19	.42	.15
07	.30	.17	.58	.63	.58	.25
Survey Results						
09	.98	.98	.97	.98	.96	.95
10	.35	.29	.29	-.01	-.15	.30
11	.96	.97	.87	.96	.96	.93
University Library						
12	.66	.58	.58	.65	.67	.53
Research Support						
13	.77	.59	.72	.70	.24	.53
14	.79	.63	.27	.42	.61	N/A
Publication Records						
15	.80	.70	.75	.75	.85	.70
16	.86	.77	.77	.83	.86	.67

physical sciences, the departments with highly regarded faculty are more likely to provide support to doctoral students as teaching assistants or research assistants on faculty research grants--thereby reducing dependency on national fellowships. (The low correlation of rated faculty quality with the fraction of students with national fellowships is not, of course, inconsistent with the thesis that programs with large numbers of students are programs with large numbers of fellowship holders.)

Correlations of rated faculty quality with measure 05, shortness of time from matriculation in graduate school to award of the doctorate, are notably high for programs in mathematics, geosciences, and chemistry and still sizeable for physics and statistics/biostatistics programs. Thus, those programs producing graduates in shorter periods of time tended to receive higher survey ratings. This finding is surprising in view of the smaller correlations in these disciplines between measures of program size and shortness of time-to-Ph.D. It seems there is a tendency for programs that produce doctoral graduates in a shorter time to have more highly rated faculty, and this tendency is relatively independent of the number of faculty members.

Correlations of ratings of faculty quality with measure 06, the fraction of program graduates with definite employment plans, are moderately high in physics and somewhat lower, but still positive, in the other disciplines. In every discipline except computer sciences the correlation of measure 08 is higher with measure 07, the fraction of graduates having agreed to employment at a Ph.D.-granting institution. These coefficients are greater than .50 in mathematics, geosciences, and physics.

The correlations of measure 08 with measure 09, the rated effectiveness of doctoral education, are uniformly very high, at or above .95 in every discipline. This finding is consistent with results from the Cartter and Roose-Andersen studies.[6] The coefficients describing the relationship between measure 08 and measure 11, familiarity with the work of program faculty, are also very high, ranging from .87 to .97. In general, evaluators were more likely to have high regard for the quality of faculty in those programs with which they were most familiar. That the correlation coefficients are as large as observed may simply reflect the fact that "known" programs tend to be those that have earned strong reputations.

Correlations of ratings of faculty quality with measure 10, the ratings of perceived improvement in program quality, are near zero for mathematics and physics programs and range from .29 to .35 in other disciplines. One might have expected that a program judged to have improved in quality would have been somewhat more likely to receive high ratings on measure 08 than would a program judged to have declined--thereby imposing a small positive correlation between these two variables.

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[6] Roose and Andersen, p. 19.

Moderately high correlations are observed in most disciplines between measure 08 and university library size (measure 12), support for research (measures 13 and 14), and publication records (measures 15 and 16). With few exceptions these coefficients are .50 or greater in all disciplines. Of particular note are the strong correlations with the two publication measures--ranging from .70 to .86. In all disciplines except statistics/biostatistics the correlations with measure 16 are higher than those with measure 15; the "weighted influence" of journals in which articles are published yields an index that tends to relate more closely to faculty reputation than does an unadjusted count of the number of articles published. Although the observed differences between the coefficients for measures 15 and 16 are not large, this result is consistent with earlier findings of Anderson et al.[7]

Correlations with Measure 14. Correlations of measure 14, reported dollars of support for R&D, with other measures are shown in Table 9.4. (Data on research expenditures in statistics/biostatistics are not available.) The pattern of relations is quite similar for programs in chemistry, computer sciences, and physics: moderately high correlations with measures of program size and somewhat higher correlations with both reputational survey results (except measure 10) and publication measures. For programs in mathematics many of these relations are positive but not as strong. For geoscience programs, measure 14 is related more closely to faculty size (measure 01) than to any other measure, and the correlations with rated quality of faculty and program effectiveness are lower than in any other discipline. In interpreting these relationships one must keep in mind the fact that the research expenditure data have not been adjusted for the number of faculty and other staff members involved in research in a program.

Correlations with Measure 16. Measure 16 is the number of published articles attributed to a program and adjusted for the "average influence" of the journals in which the articles appear. The correlations of this measure with all others appear in Table 9.5. Of particular interest are the high correlations with all three measures of program size and with the reputational survey results (excluding measure 10). Most of those coefficients exceed .70, although for programs in statistics/biostatistics they are below this level. Moderately high correlations are also observed between measure 16 and measures 12, 13, and 14. With the exception of computer science programs, the correlations between the adjusted publication measure and measure 05, time-to-Ph.D., range from .31 to .41. It should be pointed out that the exceptionally large coefficients reported for measure 15 result from the fact that the two publication measures are empirically as well as logically interdependent.

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[7] Anderson et al., p. 95.

TABLE 9.4 Correlations of the University Research Expenditures in a Discipline (Measure 14) with Other Measures, by Discipline

	Chemistry	Computer Sciences	Geo-sciences	Math	Physics	Statistics/ Biostat.
Program Size						
01	.43	.44	.61	.18	.54	N/A
02	.72	.58	.25	.41	.66	N/A
03	.66	.43	.28	.44	.68	N/A
Program Graduates						
04	.18	.22	.22	.29	.04	N/A
05	.35	-.21	-.05	.17	.31	N/A
06	.31	-.03	-.04	.23	.25	N/A
07	.20	-.16	.06	.22	.31	N/A
Survey Results						
08	.79	.63	.27	.42	.61	N/A
09	.74	.61	.25	.42	.61	N/A
10	.14	-.02	.13	-.12	-.08	N/A
11	.77	.64	.18	.43	.58	N/A
University Library						
12	.45	.16	.33	.33	.33	N/A
Research Support						
13	.55	.10	.20	.18	.07	N/A
Publication Records						
15	.70	.66	.42	.35	.80	N/A
16	.78	.73	.35	.42	.80	N/A

TABLE 9.5 Correlations of the Influence-Weighted Number of Publications (Measure 16) with Other Measures, by Discipline

	Chemistry	Computer Sciences	Geo-sciences	Math	Physics	Statistics/ Biostat.
Program Size						
01	.65	.61	.36	.63	.72	.49
02	.86	.84	.74	.81	.86	.48
03	.84	.52	.64	.78	.85	.50
Program Graduates						
04	.03	.20	.07	.15	.05	-.29
05	.41	-.04	.31	.40	.38	.37
06	.22	.14	.00	.16	.43	.11
07	.23	-.01	.39	.50	.48	.30
Survey Results						
08	.86	.77	.77	.83	.86	.67
09	.82	.75	.75	.80	.82	.63
10	.33	.05	.09	.05	-.14	.15
11	.88	.74	.70	.83	.86	.66
University Library						
12	.56	.52	.66	.59	.61	.36
Research Support						
13	.60	.35	.51	.51	.21	.56
14	.78	.73	.35	.42	.80	N/A
Publication Records						
15	.95	.98	.97	.90	.99	.98

Despite the appreciable correlations between reputational ratings of quality and program size measures, the functional relations between the two probably are complex. If there is a minimum size for a high quality program, this size is likely to vary from discipline to discipline. Increases in size beyond the minimum may represent more high quality faculty, or a greater proportion of inactive faculty, or a faculty with heavy teaching responsibilities. In attempting to select among these alternative interpretations, a single correlation coefficient provides insufficient guidance. Nonetheless, certain similarities may be seen in the pattern of correlations among the measures. High correlations consistently appear among measures 08, 09, and 11 from the reputational survey, and these measures also are prominently related to program size (measures 01, 02, and 03), to publication productivity (measures 15 and 16), to R&D expenditures (measure 14), and to library size (measure 12). These results show that for all disciplines the reputational rating measures (08, 09, and 11) tend to be associated with program size and with other correlates of size--publication volume, R&D expenditures, and library size. Furthermore, for most disciplines the reputational measures 08, 09, and 11 tend to be positively related to shortness of time-to-Ph.D. (measure 05), to employment prospects of program graduates (measures 06 and 07), and to fraction of faculty holding research grants (measure 13). These latter measures are not consistently correlated highly with the size measures or with any other measures besides reputational ratings.

ANALYSIS OF THE SURVEY RESPONSE

Measures 08-11, derived from the reputational survey, may be of particular interest to many readers since measures of this type have been the most widely used (and frequently criticized) indices of quality of graduate programs. In designing the survey instrument for this assessment the committee made several changes in the form that had been used in the Roose-Andersen study. The modifications served two purposes: to provide the evaluators with a clearer understanding of the programs that they were asked to judge and to provide the committee with supplemental information for the analysis of the survey response. One change was to restrict to 50 the number of programs that any individual was asked to evaluate. Probably the most important change was the inclusion of lists of names and ranks of individual faculty members involved in the research-doctorate programs to be evaluated on the survey form, together with the number of doctoral degrees awarded in the previous five years. Ninety percent of the evaluators were sent forms with faculty names and numbers of degrees awarded; the remaining ten percent were given forms without this information so that an analysis could be made of the effect of this modification on survey results. Another change was the addition of a question concerning an evaluator's familiarity with each of the programs. In addition to providing an index of program recognition (measure 11), the inclusion of this question permits a comparison of the ratings furnished by individuals who had considerable familiarity

TABLE 9.6 Distribution of Responses to Each Survey Item, by Discipline

	Survey Measure	Total	Chem-istry	Computer Sciences	Geo-sciences	Math	Physics	Statistics/ Biostat.
08	SCHOLARLY QUALITY OF PROGRAM FACULTY							
	Distinguished	7.2	6.3	7.5	6.5	7.7	7.9	8.3
	Strong	15.9	15.1	12.5	19.1	15.5	13.6	20.3
	Good	21.2	22.4	20.4	22.8	19.2	19.6	22.7
	Adequate	16.3	19.5	19.4	13.4	14.5	14.6	16.2
	Marginal	7.8	10.4	9.8	4.7	6.9	6.9	7.3
	Not Sufficient for Doctoral Education	2.2	3.0	3.0	.8	2.5	1.3	2.7
	Don't Know Well Enough to Evaluate	29.4	23.3	27.4	32.7	33.8	36.1	22.4
	TOTAL	100.0	100.0	100.0	100.0	100.0	100.0	100.0
09	EFFECTIVENESS OF PROGRAM IN EDUCATING SCIENTISTS							
	Extremely Effective	8.0	8.7	7.9	8.3	7.4	7.8	7.2
	Reasonably Effective	28.7	32.5	25.7	34.1	22.1	27.0	29.0
	Minimally Effective	13.2	15.0	15.7	12.1	11.3	11.1	15.1
	Not Effective	3.1	3.6	4.6	1.7	3.4	2.0	3.8
	Don't Know Well Enough to Evaluate	47.0	40.2	46.1	43.8	55.8	52.1	45.0
	TOTAL	100.0	100.0	100.0	100.0	100.0	100.0	100.0
10	CHANGE IN PROGRAM QUALITY IN LAST FIVE YEARS							
	Better	11.5	12.7	15.7	14.2	9.3	9.2	9.2
	Little or No Change	29.4	33.9	25.9	27.1	25.8	28.4	32.5
	Poorer	6.2	8.4	8.2	6.6	3.5	5.1	5.1
	Don't Know Well Enough to Evaluate	52.9	44.9	50.1	52.1	61.5	57.3	53.2
	TOTAL	100.0	100.0	100.0	100.0	100.0	100.0	100.0
11	FAMILIARITY WITH WORK OF PROGRAM FACULTY							
	Considerable	20.0	20.9	20.2	22.3	17.9	16.3	24.0
	Some	41.1	43.1	42.8	40.7	38.8	38.2	43.6
	Little or None	37.2	34.6	34.6	35.4	41.8	43.0	31.1
	No Response	1.7	1.4	2.3	1.6	1.5	2.5	1.3
	TOTAL	100.0	100.0	100.0	100.0	100.0	100.0	100.0

NOTE: For survey measures 08, 09, and 10 the "don't know" category includes a small number of cases for which the respondents provided no response to the survey item.

with a particular program and the ratings by those not as familiar with the program. Each evaluator was also asked to identify his or her own institution of highest degree and current field of specialization. This information enables the committee to compare, for each program, the ratings furnished by alumni of a particular institution with the ratings by other evaluators as well as to examine differences in the ratings supplied by evaluators in certain specialty fields.

Before examining factors that may have influenced the survey results, some mention should be made of the distributions of responses to the four survey items and the reliability (consistency) of the ratings. As Table 9.6 shows, the response distribution for each survey item does not vary greatly from discipline to discipline. For example, in judging the scholarly quality of faculty (measure 08), survey respondents in each discipline rated between 6 and 8 percent of the programs as being "distinguished" and between 1 and 3 percent as "not sufficient for doctoral education." In evaluating the effectiveness in educating research scholars/scientists, 7 to 9 percent of the programs were rated as being "extremely effective" and approximatey 2 to 5 percent as "not effective." Of particular interest in this table are the frequencies with which evaluators failed to provide responses on survey measures 08, 09, and 10. Approximately 30 percent of the total number of evaluations requested for measure 08 were not furnished because survey respondents in the mathematical and physical sciences felt that they were not familiar enough with a particular program to evaluate it. The corresponding percentages of "don't know" responses for measures 09 and 10 are considerably larger--47 and 53 percent, respectively--suggesting that survey respondents found it more difficult (or were less willing) to judge program effectiveness and change than to judge the scholarly quality of program faculty.

The large fractions of "don't know" responses are a matter of some concern. However, given the broad coverage of research-doctorate programs, it is not surprising that faculty members would be unfamiliar with many of the less distinguished programs. As shown in Table 9.7, survey respondents in each discipline were much more likely to furnish evaluations for programs with high reputational standings than they were for programs of lesser distinction. For example, for mathematical and physical science programs that received mean ratings of 4.0 or higher on measure 08, almost 95 percent of the evaluations requested on measure 08 were provided; 85 and 77 percent were provided on measures 09 and 10. In contrast, the corresponding response rates for programs with mean ratings below 2.0 are much lower--52, 35, and 28 percent response on measures 08, 09, and 10, respectively.

Of great importance to the interpretation of the survey results is the reliability of the response. How much confidence can one have in the reliability of a mean rating reported for a particular program? In the first table in each of the preceding six chapters, estimated standard errors associated with the mean ratings of every program are presented for all four survey items (measures 08-11). While there is some variation in the magnitude of the standard errors reported in every discipline, they rarely exceed .15 for any of the four measures and typically range from .05 to .10. For programs with higher mean

TABLE 9.7 Survey Item Response Rates, by Discipline and Mean Rating on Measure 08

Survey Measure	Total	Chemistry	Computer Sciences	Geosciences	Math	Physics	Statistics/ Biostat.
08 SCHOLARLY QUALITY OF PROGRAM FACULTY							
Mean Rating on Measure 08							
4.0 or Higher	94.7	98.0	99.4	87.6	95.9	93.7	97.0
3.0 - 3.9	85.9	91.9	91.8	76.3	83.6	83.6	91.3
2.0 - 2.9	67.7	77.4	76.4	60.7	62.5	61.5	72.3
Less than 2.0	51.7	61.2	51.6	40.1	45.8	39.9	58.5
09 EFFECTIVENESS OF PROGRAM IN EDUCATING SCIENTISTS							
Mean Rating on Measure 08							
4.0 or Higher	85.2	92.6	90.9	79.4	80.9	85.4	85.4
3.0 - 3.9	68.1	77.1	72.4	66.2	56.3	65.6	68.8
2.0 - 2.9	47.5	57.4	53.1	47.6	37.8	42.8	47.1
Less than 2.0	34.9	42.9	36.8	31.6	28.5	25.7	36.3
10 CHANGE IN PROGRAM QUALITY IN LAST FIVE YEARS							
Mean Rating on Measure 08							
4.0 or Higher	76.8	88.3	85.6	69.0	70.0	76.7	74.7
3.0 - 3.9	62.3	74.0	67.5	56.8	51.9	61.9	60.3
2.0 - 2.9	43.1	54.4	52.2	40.9	33.7	38.5	39.9
Less than 2.0	27.7	35.5	29.1	22.7	22.0	19.9	27.7

ratings the estimated errors associated with these means are generally smaller--a finding consistent with the fact that survey respondents were more likely to furnish evaluations for programs with high reputational standing. The "split-half" correlations[8] presented in Table 9.8 give an indication of the overall reliability of the survey results in each discipline and for each measure. In the derivation of these correlations, individual ratings of each program were randomly divided into two groups (A and B), and a separate mean rating was computed for each group. The last column in Table 9.8 reports the correlations between the mean program ratings of the two groups and is not corrected for the fact that the mean ratings of each group are based on only half rather than a full set of the responses.[9] As the reader will note, the coefficients reported for measure 08, the scholarly quality of program faculty, are in the range of .96 to

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[8] For a discussion of the interpretation of "split-half" coefficients, see Robert L. Thorndike and Elizabeth Hagan, Measurement and Evaluation in Psychology and Education, John Wiley & Sons, New York, 1969, pp. 182-185.

[9] To compensate for the smaller sample size the "split-half" coefficient may be adjusted using the Spearman-Brown formula: $r' = 2r/(1 + r)$. This adjustment would have the effect of increasing a correlation of .70, for example, to .82; a correlation of .80 to .89; a correlation of .90 to .95; and a correlation of .95 to .97.

TABLE 9.8 Correlations Between Two Sets of Average Ratings from Two Randomly Selected Groups of Evaluators in the Mathematical and Physical Sciences

MEASURE 08: SCHOLARLY QUALITY OF PROGRAM FACULTY

Discipline	Mean Rating		Std. Deviation		Correlation	
	Group A	Group B	Group A	Group B	N	r
Chemistry	2.55	2.53	1.00	1.00	145	.99
Computer Sciences	2.51	2.50	.97	1.00	57	.96
Geosciences	2.92	2.93	.83	.82	91	.97
Mathematics	2.64	2.66	1.03	1.00	114	.98
Physics	2.66	2.63	.99	1.01	122	.96
Statistics/Biostat.	2.80	2.79	.94	.97	63	.98

MEASURE 09: EFFECTIVENESS OF PROGRAM IN EDUCATING SCHOLARS

Discipline	Mean Rating		Std. Deviation		Correlation	
	Group A	Group B	Group A	Group B	N	r
Chemistry	1.63	1.64	.54	.54	145	.95
Computer Sciences	1.52	1.50	.56	.56	57	.95
Geosciences	1.74	1.76	.44	.45	91	.94
Mathematics	1.54	1.55	.57	.59	114	.91
Physics	1.63	1.65	.52	.51	122	.89
Statistics/Biostat.	1.55	1.57	.54	.53	63	.97

MEASURE 10: IMPROVEMENT IN PROGRAM IN LAST FIVE YEARS

Discipline	Mean Rating		Std. Deviation		Correlation	
	Group A	Group B	Group A	Group B	N	r
Chemistry	1.05	1.06	.22	.23	145	.76
Computer Sciences	1.14	1.11	.28	.29	57	.82
Geosciences	1.15	1.13	.28	.30	91	.77
Mathematics	1.12	1.14	.22	.22	114	.62
Physics	1.10	1.11	.26	.25	122	.64
Statistics/Biostat.	1.06	1.07	.28	.27	63	.85

MEASURE 12: FAMILIARITY WITH WORK OF PROGRAM FACULTY

Discipline	Mean Rating		Std. Deviation		Correlation	
	Group A	Group B	Group A	Group B	N	r
Chemistry	.86	.86	.43	.41	145	.95
Computer Sciences	.84	.86	.42	.45	57	.94
Geosciences	.87	.86	.36	.37	91	.93
Mathematics	.75	.76	.39	.40	114	.95
Physics	.71	.73	.42	.42	122	.96
Statistics/Biostat.	.92	.94	.42	.40	63	.95

TABLE 9.9 Comparison of Mean Ratings for 11 Mathematics Programs Included in Two Separate Survey Administrations

	Survey Measure	All Evaluators				Evaluators Rating the Same Program in Both Surveys			
		First		Second		First		Second	
		N	$\bar{X}$	N	$\bar{X}$	N	$\bar{X}$	N	$\bar{X}$
Program A	08	100	4.9	114	4.9	50	4.9	50	4.9
	09	90	2.7	100	2.8	42	2.7	43	2.7
	10	74	1.2	83	1.2	38	1.1	34	1.2
	11	100	1.6	115	1.6	50	1.5	50	1.6
Program B	08	94	4.6	115	4.6	48	4.6	50	4.5
	09	81	2.6	91	2.5	40	2.6	39	2.5
	10	69	1.0	82	1.0	37	1.0	36	0.9
	11	98	1.4	116	1.4	50	1.5	50	1.5
Program C	08	86	3.4	103	3.6	42	3.4	44	3.5
	09	56	2.0	66	2.1	28	2.1	29	2.0
	10	55	1.1	62	1.3	30	1.2	27	1.4
	11	99	1.0	116	1.1	50	1.1	50	1.0
Program D	08	74	3.0	93	3.0	37	2.8	38	2.9
	09	50	1.8	48	1.6	27	1.7	16	1.6
	10	46	1.4	52	1.5	24	1.4	23	1.5
	11	90	1.0	113	0.9	46	1.0	46	0.9
Program E	08	69	3.0	95	3.1	39	3.0	46	3.1
	09	40	1.8	60	1.9	25	1.8	30	1.8
	10	36	0.8	58	0.9	24	0.8	29	0.9
	11	96	0.8	115	0.9	52	0.9	52	1.0
Program F	08	63	2.9	90	3.0	26	3.0	32	3.1
	09	35	1.8	46	1.7	10	1.6	13	1.8
	10	32	1.1	43	1.1	11	1.3	12	1.2
	11	95	0.7	115	0.8	43	0.7	44	0.7
Program G	08	69	2.7	92	2.8	39	2.7	39	3.0
	09	35	1.7	45	1.6	17	1.7	19	1.7
	10	36	1.1	43	1.2	17	1.1	19	1.2
	11	85	0.9	116	0.8	46	0.9	46	0.9
Program H	08	58	2.2	73	2.5	36	2.2	37	2.4
	09	32	1.3	43	1.3	22	1.2	19	1.3
	10	30	1.5	39	1.5	20	1.7	17	1.4
	11	90	0.7	116	0.6	51	0.7	52	0.6
Program I	08	55	2.0	74	1.9	30	1.9	30	2.0
	09	33	1.0	41	0.9	19	1.0	18	0.8
	10	27	1.2	31	1.1	15	1.1	13	1.2
	11	99	0.5	115	0.5	50	0.5	50	0.5
Program J	08	51	1.5	67	1.5	26	1.4	28	1.4
	09	31	0.8	36	0.7	14	0.6	14	0.7
	10	26	1.2	23	1.1	14	1.2	12	1.3
	11	96	0.5	113	0.3	49	0.4	48	0.4
Program K	08	33	1.2	48	1.2	17	1.1	21	1.4
	09	19	0.8	21	0.5	11	0.6	8	0.4
	10	12	0.8	15	0.9	5	1.0	5	0.8
	11	99	0.2	114	0.2	48	0.2	47	0.2

.98--indicating a high degree of consistency in evaluators' judgments. The correlations reported for measures 09 and 11, the rated effectiveness of a program and evaluators' familiarity with a program, are somewhat lower but still at a level of .92 or higher in each discipline. Not surprisingly, the reliability coefficients for ratings of change in program quality in the last five years (measure 10) are considerably lower, ranging from .67 to .88 in the six mathematical and physical science disciplines. While these coefficients represent tolerable reliability, it is quite evident that the responses to measure 10 are not as reliable as the responses to the other three items.

Further evidence of the reliability of the survey responses is presented in Table 9.9. As mentioned in Chapter VI, 11 mathematics programs, selected at random, were included on a second form sent to 178 survey respondents in this discipline, and 116 individuals (65 percent) furnished responses to the second survey. A comparison of the overall results of the two survey administrations (columns 2 and 4 in Table 9.9) demonstrates the consistency of the ratings provided for each of the 11 programs. The average, absolute observed difference in the two sets of mean ratings is less than 0.1 for each measure. Columns 6 and 8 in this table report the results based on the responses of only those evaluators who had been asked to consider a particular program in both administrations of the survey. (For a given program approximately 40-45 percent of the 116 respondents to the second survey were asked to evaluate that program in the prior survey.) It is not surprising to find comparable small differences in the mean ratings provided by this subgroup of evaluators.

Critics of past reputational studies have expressed concern about the credibility of reputational assessments when evaluators provide judgments of programs about which they may know very little. As already mentioned, survey participants in this study were offered the explicit alternative, "Don't know well enough to evaluate." This response option was quite liberally used for measures 08, 09, and 10, as shown in Table 9.6. In addition, evaluators were asked to indicate their degree of familiarity with each program. Respondents reported "considerable" familiarity with an average of only one program in every five. While this finding supports the conjecture that many program ratings are based on limited information, the availability of reported familiarity permits us to analyze how ratings vary as a function of familiarity.

This issue can be addressed in more than one way. It is evident from the data reported in Table 9.10 that mean ratings of the scholarly quality of program faculty tend to be higher if the evaluator has considerable familiarity with the program. There is nothing surprising or, for that matter, disconcerting about such an association. When a particular program fails to provoke more than vague images in the evaluator's mind, he or she is likely to take this as some indication that the program is not an extremely lustrous one on the national scene. While visibility and quality are scarcely the same, the world of research in higher education is structured to encourage high quality to achieve high visibility, so that any association of the two is far from spurious.

TABLE 9.10 Mean Ratings of Scholarly Quality of Program Faculty, by Evaluator's Familiarity with Work of Faculty

	MEAN RATINGS		CORRELATION	
	Consid-erable	Some/ Little	r	N
Chemistry	2.81	2.46	.93	145
Computer Sciences	2.83	2.47	.89	55
Geosciences	3.24	2.80	.89	91
Mathematics	3.05	2.55	.92	114
Physics	3.00	2.64	.87	116
Statistics/Biostat.	2.99	2.69	.94	63

NOTE: N reported in last column represents the number of programs with a rating from at least one evaluator in each of the two groups.

From the data presented in Table 9.10 it is evident that if mean ratings were computed on the basis of the responses of only those most familiar with programs, the values reported for individual programs would be increased. A largely independent question is whether a restriction of this kind would substantially change our sense of the relative standings of programs on this measure. Quite naturally, the answer depends to some degree on the nature of the restriction imposed. For example, if we exclude evaluations provided by those who confessed "little or no" familiarity with particular programs, then the revised mean ratings would be correlated at a level of at least .99 with the mean ratings computed using all of the data.[10] (This similarity arises, in part, because only a small fraction of evaluations are given on the basis of no more than "little" familiarity with the program.)

The third column in Table 9.10 presents the correlation in each discipline between the array of mean ratings supplied by respondents claiming "considerable" familiarity and the mean ratings of those indicating "some" or "little or no" familiarity with particular programs. This coefficient is a rather conservative estimate of agreement since there is not a sufficient number of ratings from those with "considerable" familiarity to provide highly stable means. Were more such ratings available, one might expect the correlations to be higher. However, even in the form presented, the correlations, which are at least .92 in all six disciplines, are high enough to suggest that the relative standing of programs on measure 08 is not greatly affected by the admixtures of ratings from evaluators who recognize that their knowledge of a given program is limited.

As mentioned previously, 90 percent of the survey sample members were supplied the names of faculty members associated with each program to be evaluated, along with the reported number of program

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[10] These correlations, not reported here, were found to exceed .995 for program ratings in chemistry, geosciences, mathematics, and statistics/biostatistics.

TABLE 9.11 Item Response Rate on Measure 08, by Selected Characteristics of Survey Evaluators in the Mathematical and Physical Sciences

	Total	Chemistry	Computer Sciences	Geosciences	Math	Physics	Statistics/ Biostat.
EVALUATOR'S FAMILIARITY WITH PROGRAM							
Considerable	100.0	100.0	100.0	100.0	100.0	100.0	100.0
Some	98.2	98.8	97.2	98.1	98.0	98.4	98.2
Little or None	26.4	36.6	29.2	13.5	23.6	22.0	33.3
TYPE OF SURVEY FORM							
Names	70.6	77.0	72.4	67.9	65.1	63.3	78.7
No Names	70.8	73.6	74.2	62.6	74.7	69.3	69.8
INSTITUTION OF HIGHEST DEGREE							
Alumni	98.0	98.1	100.0	95.1	98.8	100.0	97.1
Nonalumni	70.4	76.5	72.3	67.0	65.9	63.6	77.3
EVALUATOR'S PROXIMITY TO PROGRAM							
Same Region	81.8	87.7	79.9	81.8	77.2	78.5	83.2
Outside Region	69.0	75.1	71.4	65.3	64.5	61.8	76.7

NOTE: The item response rate is the percentage of the total ratings requested from survey participants that included a response other than "don't know."

graduates (Ph.D. or equivalent degrees) in the previous five years. Since earlier reputational surveys had not provided such information, 10 percent of the sample members, randomly selected, were given forms without faculty names or doctoral data, as a "control group." Although one might expect that those given faculty names would have been more likely than other survey respondents to provide evaluations of the scholarly quality of program faculty, no appreciable differences were found (Table 9.11) between the two groups in their frequency of response to this survey item. (The reader may recall that the provision of faculty names apparently had little effect on survey sample members' willingness to complete and return their questionnaires.[11])

The mean ratings provided by the group furnished faculty names are lower than the mean ratings supplied by other respondents (Table 9.12). Although the differences are small, they attract attention because they are reasonably consistent from discipline to discipline and because the direction of the differences was not anticipated. After all, those programs more familiar to evaluators tended to receive higher ratings, yet when steps were taken to enhance the evaluator's familiarity, the resulting ratings are somewhat lower. One post hoc interpretation of this finding is that a program may be considered to have distinguished faculty if even only a few of its members are considered by the evaluator to be outstanding in their field. However, when a full list of program faculty is provided, the evaluator may be influenced by the number of individuals whom he or she could not consider to be distinguished. Thus, the presentation of these additional, unfamiliar names may occasionally result in a lower rating of program faculty.

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[11] See Table 2.3.

However interesting these effects may be, one should not lose sight of the fact that they are small at best and that their existence does not necessarily imply that a program's relative standing on measure 08 would differ much whichever type of survey form were used. Since only about 1 in 10 ratings was supplied without the benefit of faculty names, it is hard to establish any very stable picture of relative mean ratings of individual programs. However, the correlations between the mean ratings supplied by the two groups are reasonably high--ranging from .85 to .94 in the six disciplines (Table 9.12). Were these coefficients adjusted for the fact that the group furnished forms without names constituted only about 10 percent of the survey respondents, they would be substantially larger. From this result it seems reasonable to conclude that differences in the alternative survey forms used are not likely to be responsible for any large-scale reshuffling in the reputational ranking of programs on measure 08. It also suggests that the inclusion of faculty names in the committee's assessment need not prevent comparisons of the results with those obtained from the Roose-Andersen survey.

Another factor that might be thought to influence an evaluator's judgment about a particular program is the geographic proximity of that program to the evaluator. There is enough regional traffic in academic life that one might expect proximate programs to be better known than those in distant regions of the country. This hypothesis may apply especially to the smaller and less visible programs and is

TABLE 9.12 Mean Ratings of Scholarly Quality of Program Faculty, by Type of Survey Form Provided to Evaluator

	MEAN RATINGS		CORRELATION	
	Names	No Names	r	N
Chemistry	2.53	2.66	.93	145
Computer Sciences	2.49	2.61	.93	57
Geosciences	2.93	3.01	.88	90
Mathematics	2.62	2.72	.94	113
Physics	2.62	2.88	.85	122
Statistics/Biostat.	2.79	2.85	.92	63

NOTE: N reported in last column represents the number of programs with a rating from at least one evaluator in each of the two groups.

TABLE 9.13 Mean Ratings of Scholarly Quality of Program Faculty, by Evaluator's Proximity to Region of Program

	MEAN RATINGS		CORRELATION	
	Nearby	Outside	r	N
Chemistry	2.59	2.54	.95	144
Computer Sciences	2.51	2.52	.95	55
Geosciences	3.00	2.94	.93	87
Mathematics	2.74	2.64	.94	114
Physics	2.75	2.65	.88	120
Statistics/Biostat.	2.96	2.77	.94	62

NOTE: N reported in last column represents the number of programs with a rating from at least one evaluator in each of the two groups.

confirmed by the survey results. For purposes of analysis, programs were assigned to one of nine geographic regions[12] in the United States, and ratings of programs within an evaluator's own region are categorized in Table 9.13 as "nearby." Ratings of programs in any of the other eight regions were put in the "outside" group. Findings reported elsewhere in this chapter confirm that evaluators were more likely to provide ratings if a program was within their own region of the country,[13] and it is reasonable to imagine that the smaller and the less visible programs received a disproportionate share of their ratings either from evaluators within their own region or from others who for one reason or another were particularly familiar with programs in that region.

Although the data in Table 9.13 suggest that "nearby" programs were given higher ratings than those outside the evaluator's region, the differences in reported means are quite small and probably represent no more than a secondary effect that might be expected because, as we have already seen, evaluators tended to rate higher those programs with which they were more familiar. Furthermore, the high correlations found between the mean ratings of the two groups indicate that the relative standings of programs are not dramatically influenced by the geographic proximity of those evaluating it.

Another consideration that troubles some critics is that large programs may be unfairly favored in a faculty survey because they are likely to have more alumni contributing to their ratings who, it would stand to reason, would be generous in the evaluations of their alma

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[12] See Appendix I for a list of the states included in each region.

[13] See Table 9.11.

TABLE 9.14 Mean Ratings of Scholarly Quality of Program Faculty, by Evaluator's Institution of Highest Degree

	MEAN RATINGS		NUMBER OF PROGRAMS WITH ALUMNI RATINGS
	Alumni	Nonalumni	N
Chemistry	3.88	3.60	37
Computer Sciences	3.56	3.02	26
Geosciences	3.83	3.51	34
Mathematics	3.73	3.41	37
Physics	4.11	3.87	27
Statistics/Biostat.	3.90	3.32	35

NOTE: The pairs of means reported in each discipline are computed for a subset of programs with a rating from at least one alumnus and are substantially greater than the mean ratings for the full set of programs in each discipline.

maters. Information collected in the survey on each evaluator's institution of highest degree enables us to investigate this concern. The findings presented in Table 9.14 support the hypothesis that alumni provided generous ratings--with differences in the mean ratings (for measure 08) of alumni and nonalumni ranging from .24 to .58 in the six disciplines. It is interesting to note that the largest differences are found in statistics/biostatistics and computer sciences, the disciplines with the fewest programs. Given the appreciable differences between the ratings furnished by program alumni and other evaluators, one might ask how much effect this has had on the overall results of the survey. The answer is "very little." As shown in the table, in chemistry and physics only one program in every four received ratings from any alumnus; in statistics/biostatistics slightly more than half of the programs were evaluated by one or more alumni.[14] Even in the latter discipline, however, the fraction of alumni providing ratings of a program is always quite small and should have had minimal impact on the overall mean rating of any program. To be certain that this was the case, mean ratings of the scholarly quality of faculty were recalculated for every mathematical and physical science program--with the evaluations provided by alumni excluded. The results were compared with the mean scores based on a full set of evaluations. Out of the 592 mathematical and physical science programs evaluated in the survey, only 1 program (in geosciences) had an observed difference as large as 0.2, and for 562 programs (95 percent) their mean ratings remain unchanged (to the nearest tenth of a unit). On the basis of these findings the committee saw no reason to exclude alumni ratings in the calculation of program means.

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[14] Because of the small number of alumni ratings in every discipline, the mean ratings for this group are unstable and therefore the correlations between alumni and nonalumni mean ratings are not reported.

Another concern that some critics have is that a survey evaluation may be affected by the interaction of the research interests of the evaluator and the area(s) of focus of the research-doctorate program to be rated. It is said, for example, that some narrowly focused programs may be strong in a particular area of research but that this strength may not be recognized by a large fraction of evaluators who happen to be unknowledgeable in this area. This is a concern more difficult to address than those discussed in the preceding pages since little or no information is available about the areas of focus of the programs being evaluated (although in certain disciplines the title of a department or academic unit may provide a clue). To obtain a better understanding of the extent to which an evaluator's field of specialty may have influenced the ratings he or she has provided, evaluators in physics and in statistics/biostatistics were separated into groups according to their specialty fields (as reported on the survey questionnaire). In physics, Group A includes those specializing in elementary particles and nuclear structure, and Group B is made up of those in all other areas of physics. In statistics/biostatistics, Group A consists of evaluators who designated biostatistics or biomathematics as their specialty and Group B of those in all other specialty areas of statistics. The mean ratings of the two groups in each discipline are reported in Table 9.15. The program ratings

TABLE 9.15 Mean Ratings of Scholarly Quality of Program Faculty, by Evaluator's Field of Specialty Within Physics or Statistics/Biostatistics

PHYSICS: Group A includes evaluators in elementary particles and nuclear structure; Group B includes those in atomic/molecular, solid state, and other fields of physics.

STATISTICS/BIOSTATISTICS: Group A includes evaluators in biostatistics, biometrics, and epidemiology; Group B includes those in all other fields of statistics.

	MEAN RATINGS		CORRELATION	
	Group A	Group B	r	N
Physics	2.58	2.68	.95	122
Statistics/Biostat.	3.13	2.73	.93	63

NOTE: N reported in last column represents the number of programs with a rating from at least one evaluator in each of the two groups.

supplied by evaluators in elementary particles and nuclear structure are, on the average, slightly below those provided by other physicists. The mean ratings of the biostatistics group are typically higher than those of other statisticians. Despite these differences there is a high degree of correlation in the mean ratings provided by the two groups in each discipline. Although the differences in the mean ratings of biostatisticians (Group A) and other statisticians (Group B) are comparatively large, a detailed inspection of the individual ratings reveals that biomedical evaluators rated programs appreciably higher regardless of whether a program was located in a department of biostatistics (and related fields) or in a department outside the biomedical area. Although one cannot conclude from these findings that an evaluator's specialty field has no bearing on how he or she rates a program, these findings do suggest that the relative standings of programs in physics and statistics/biostatistics would not be greatly altered if the ratings by either group were discarded.

INTERPRETATION OF REPUTATIONAL SURVEY RATINGS

It is not hard to foresee that results from this survey will receive considerable attention through enthusiastic and uncritical reporting in some quarters and sharp castigation in others. The study committee understands the grounds for both sides of this polarized response but finds that both tend to be excessive. It is important to make clear how we view these ratings as fitting into the larger study of which they are a part.

The reputational results are likely to receive a disproportionate degree of attention for several reasons, including the fact that they reflect the opinions of a large group of faculty colleagues and that they form a bridge with earlier studies of graduate programs. But the results will also receive emphasis because they alone, among all of the measures, seem to address quality in an overall or global fashion. While most recognize that "objective" program characteristics (i.e., publication productivity, research funding, or library size) have some bearing on program quality, probably no one would contend that a single one of these measures encompasses all that need be known about the quality of research-doctorate programs. Each is obviously no more than an indicator of some aspect of program quality. In contrast, the reputational ratings are global from the start because the respondents are asked to take into account many objective characteristics and to arrive at a general assessment of the quality of the faculty and effectiveness of the program. This generality has self-evident appeal.

On the other hand, it is wise to keep in mind that these reputational ratings are measures of perceived program quality rather than of "quality" in some ideal or absolute sense. What this means is that, just as for all of the more objective measures, the reputational ratings represent only a partial view of what most of us would consider quality to be; hence, they must be kept in careful perspective.

Some critics may argue that such ratings are positively misleading because of a variety of methodological artifacts or because they are supplied by "judges" who often know very little about the programs they are rating. The committee has conducted the survey in a way that permits the empirical examination of a number of the alleged artifacts and, although our analysis is by no means exhaustive, the general conclusion is that their effects are slight.

Among the criticisms of reputational ratings from prior studies are some that represent a perspective that may be misguided. This perspective assumes that one asks for ratings in order to find out what quality really is and that to the degree that the ratings miss the mark of "quintessential quality," they are unreal, although the quality that they attempt to measure is real. What this perspective misses is the reality of quality and the fact that impressions of quality, if widely shared, have an imposing reality of their own and therefore are worth knowing about in their own right. After all, these perceptions govern a large-scale system of traffic around the nation's graduate institutions--for example, when undergraduate students seek the advice of professors concerning graduate programs that they might attend. It is possible that some professors put in this position disqualify themselves on grounds that they are not well informed about the relative merits of the programs being considered. Most faculty members, however, surely attempt to be helpful on the basis of impressions gleaned from their professional experience, and these assessments are likely to have major impact on student decision-making. In short, the impressions are real and have very real effects not only on students shopping for graduate schools but also on other flows, such as job-seeking young faculty and the distribution of research resources. At the very least, the survey results provide a snapshot of these impressions from discipline to discipline. Although these impressions may be far from ideally informed, they certainly show a strong degree of consensus within each discipline, and it seems safe to assume that they are more than passingly related to what a majority of keen observers might agree program quality is all about.

COMPARISON WITH RESULTS OF THE ROOSE-ANDERSEN STUDY

An analysis of the response to the committee's survey would not be complete without comparing the results with those obtained in the survey by Roose and Andersen 12 years earlier. Although there are obvious similarities in the two surveys, there are also some important differences that should be kept in mind in examining individual program ratings of the scholarly quality of faculty. Already mentioned in this chapter is the inclusion, on the form sent to 90 percent of the sample members in the committee's survey, of the names and academic ranks of faculty and the numbers of doctoral graduates in the previous five years. Other significant changes in the committee's form are the identification of the university department or academic unit in which each program may be found, the restriction of requesting evaluators to make judgments about no more than 50 research-doctorate programs in their discipline, and the presentation of these programs in random sequence on each survey form. The sampling frames used in the two surveys also differ. The sample selected in the earlier study included only individuals who had been nominated by the participating universities, while more than one-fourth of the sample in the committee's survey were chosen at random from full faculty lists. (Except for this difference the samples were quite similar--i.e., in terms of number of evaluators in each discipline and the fraction of senior scholars.[15])

Several dissimilarities in the coverage of the Roose-Andersen and this committee's reputational assessments should be mentioned. The former included a total of 130 institutions that had awarded at least 100 doctoral degrees in two or more disciplines during the FY1958-67 period. The institutional coverage in the committee's assessment was based on the number of doctorates awarded in each discipline (as described in Chapter I) and covered a total population of 228 universities. Most of the universities represented in the present study but not the earlier one are institutions that offered research-doctorate programs in a limited set of disciplines. In the Roose-Andersen study, programs in five mathematical and physical science disciplines were rated: astronomy, chemistry, geology, mathematics, and physics. In the committee's assessment, two disciplines were added to this list[16]--computer sciences and statistics/biostatistics--and programs in astronomy were not evaluated (for reasons explained in Chapter I). Finally, in the Roose-Andersen study only one set of ratings was compiled from each institution represented in a discipline, whereas in the committee's survey, separate ratings were requested if a university offered more than one research-doctorate program in a given discipline. The consequences of these differences in survey coverage are quite apparent: in the committee's survey, evaluations were requested for a total of 593 research-doctorate programs in the mathematical and physical sciences, compared with 444 programs in the Roose-Andersen study.

Figures 9.1-9.4 plot the mean ratings of scholarly quality of faculty in programs included in both surveys; sets of ratings are graphed for 103 programs in chemistry, 57 in geosciences, 86 in mathematics, and 90 in physics. Since in the Roose-Andersen study programs were identified by institution and discipline (but not by department), the matching of results from this survey with those from

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[15] For a description of the sample group used in the earlier study, see Roose and Andersen, pp. 28-31.

[16] It should be emphasized that the committee's assessment of geoscience programs encompasses--in addition to geology--geochemistry, geophysics, and other earth sciences.

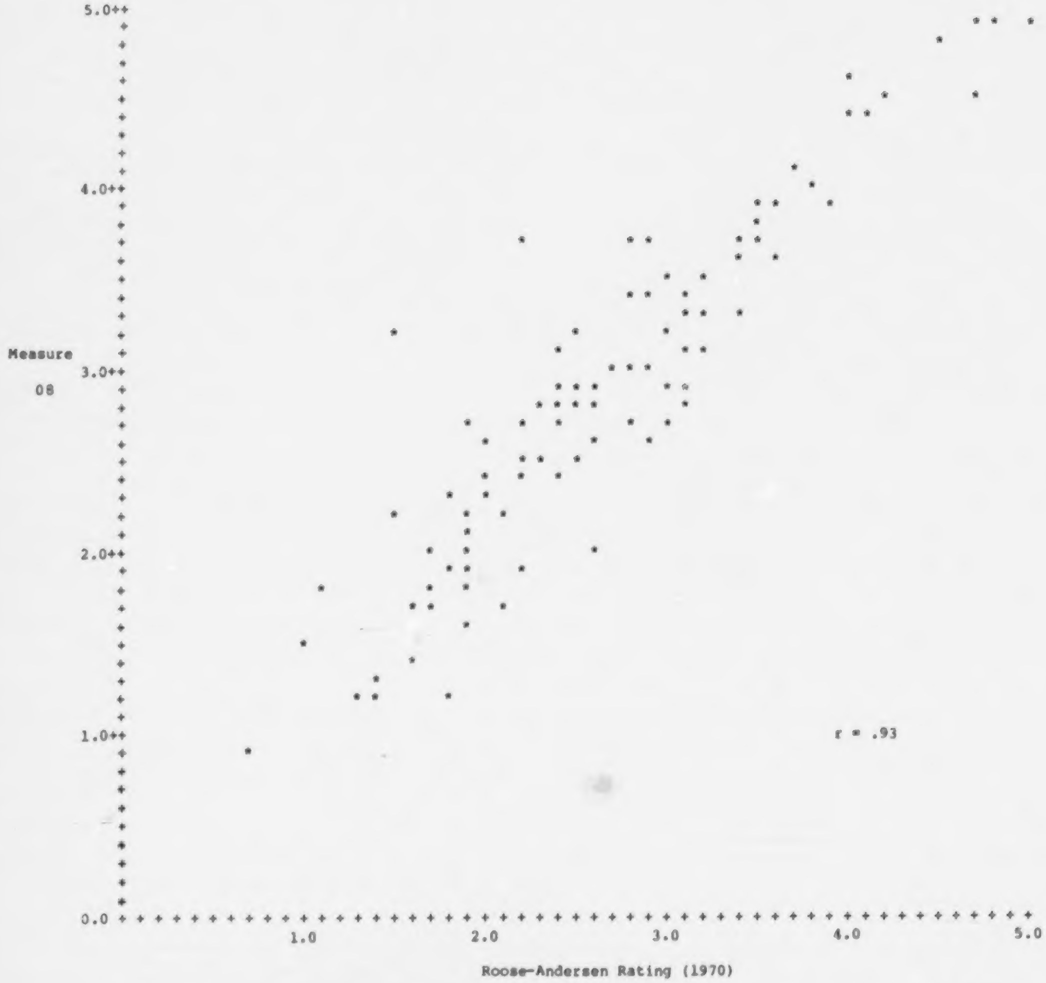

FIGURE 9.1 Mean rating of scholarly quality of faculty (measure 08) versus mean rating of faculty in the Roose-Andersen study--103 programs in chemistry.

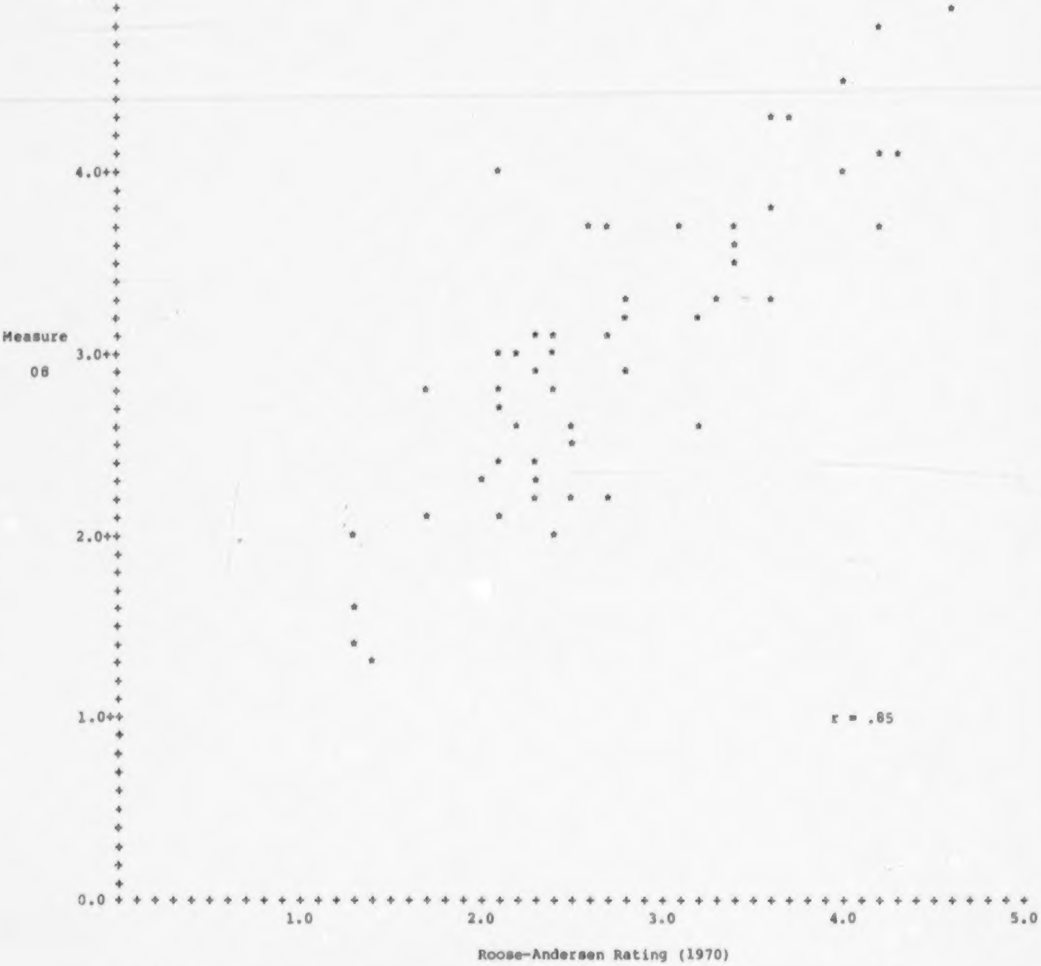

FIGURE 9.2 Mean rating of scholarly quality of faculty (measure 08) versus mean rating of faculty in the Roose-Andersen study--57 programs in geosciences.

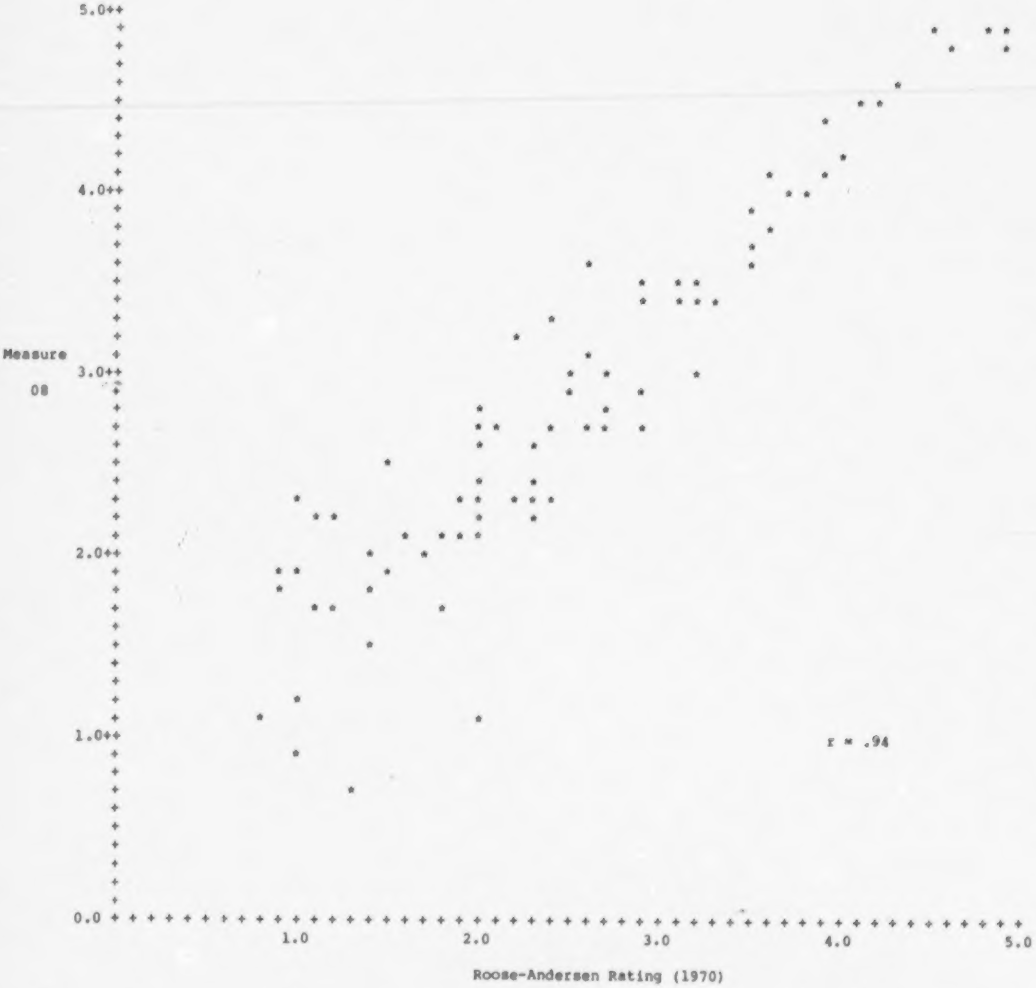

FIGURE 9.3 Mean rating of scholarly quality of faculty (measure 08) versus mean rating of faculty in the Roose-Andersen study--86 programs in mathematics.

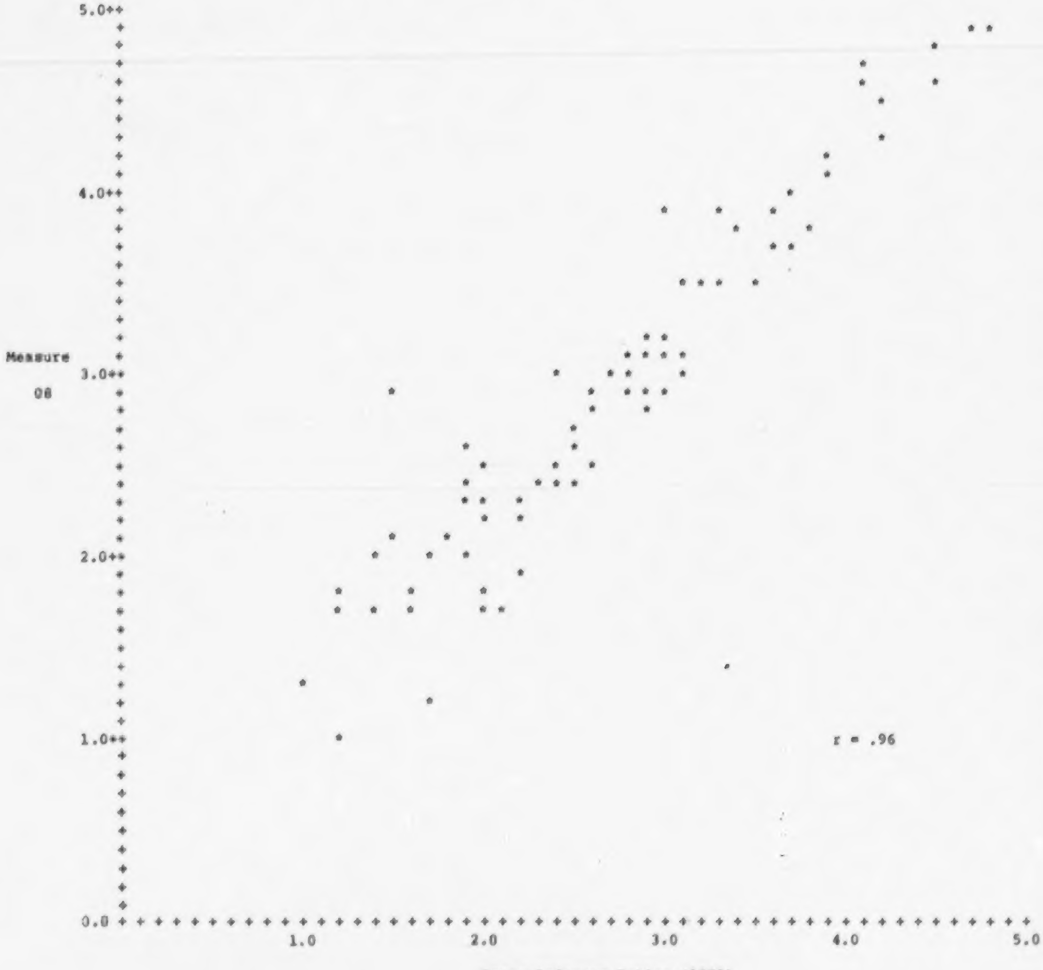

FIGURE 9.4 Mean rating of scholarly quality of faculty (measure 08) versus mean rating of faculty in the Roose-Andersen study--90 programs in physics.

the committee's survey is not precise. For universities represented in the latter survey by more than one program in a particular discipline, the mean rating for the program with the largest number of graduates (measure 02) is the only one plotted here. Although the results of both surveys are reported on identical scales, some caution must be taken in interpreting differences in the mean ratings a program received in the two evaluations. It is impossible to estimate what effect all of the differences described above may have had on the results of the two surveys. Furthermore, one must remember that the reported scores are based on the opinions of different groups of faculty members and were provided at different time periods. In 1969, when the Roose-Andersen survey was conducted, graduate departments in most universities were still expanding and not facing the enrollment and budget reductions that many departments have had to deal with in recent years. Consequently, a comparison of the overall findings from the two surveys reveals nothing about how much the quality of graduate education has improved (or declined) in the past decade. Nor should the reader place much stock in any small differences in the mean ratings that a particular program may have received in the two surveys. On the other hand, it is of particular interest to note the high correlations between the results of the evaluations. For programs in chemistry, mathematics, and physics the correlation coefficients range between .93 and .96; in the geosciences the coefficient is .85. The lower coefficient in geosciences may be explained, in part, by the difference, described in footnote 16, in the field coverage of the two surveys. The extraordinarily high correlations found in chemistry, mathematics, and physics may suggest to some readers that reputational standings of programs in these disciplines have changed very little in the last decade. However, differences are apparent for some institutions. Also, one must keep in mind that the correlations are based on the reputational ratings of only three-fourths of the programs evaluated in this assessment in these disciplines and do not take into account the emergence of many new programs that did not exist or were too small to be rated in the Roose-Andersen study.

FUTURE STUDIES

One of the most important objectives in undertaking this assessment was to test new measures not used extensively in past evaluations of graduate programs. Although the committee believes that it has been successful in this effort, much more needs to be done. First and foremost, studies of this kind should be extended to cover other types of programs and other disciplines not included in this effort. As a consequence of budgeting limitations, the committee had to restrict its study to 32 disciplines, selected on the basis of the number of doctorates awarded in each. Among those omitted were programs in astronomy, which was included in the Roose-Andersen study; a multidimensional assessment of research-doctorate programs in this and many other important disciplines would be of value. Consideration should also be given to embarking on evaluations of programs offering other types of graduate and professional degrees. As a matter of fact, plans for including master's-degree programs in this assessment were originally contemplated, but because of a lack of available information about the resources and graduates of programs at the master's level, it was decided to focus on programs leading to the research doctorate.

Perhaps the most debated issue the committee has had to address concerned which measures should be reported in this assessment. In fact, there is still disagreement among some of its members about the relative merits of certain measures, and the committee fully recognizes a need for more reliable and valid indices of the quality of graduate programs. First on a list of needs is more precise and meaningful information about the product of research-doctorate programs--the graduates. For example, what fraction of the program graduates have gone on to be productive investigators--either in the academic setting or in government and industrial laboratories? What fraction have gone on to become outstanding investigators--as measured by receipt of major prizes, membership in academies, and other such distinctions? How do program graduates compare with regard to their publication records? Also desired might be measures of the quality of the students applying for admittance to a graduate program (e.g., Graduate Record Examination scores, undergraduate grade point averages). If reliable data of this sort were made available, they might provide a useful index of the reputational standings of programs, from the perspective of graduate students.

A number of alternative measures relevant to the quality of program faculty were considered by the committee but not included in the assessment because of the associated difficulties and costs of compiling the necessary data. For example, what fraction of the program faculty were invited to present papers at national meetings? What fraction had been elected to prestigious organizations/groups in their field? What fraction had received senior fellowships and other awards of distinction? In addition, it would be highly desirable to supplement the data presented on NSF, NIH, and ADAMHA research grant awards (measure 13) with data on awards from other federal agencies (e.g., Department of Defense, Department of Energy, National Aeronautics and Space Administration) as well as from major private foundations.

As described in the preceding pages, the committee was able to make several changes in the survey design and procedures, but further improvements could be made. Of highest priority in this regard is the expansion of the survey sample to include evaluators from outside the academic setting (in particular, those in government and industrial laboratories who regularly employ graduates of the programs to be evaluated). To add evaluators from these sectors would require a major effort in identifying the survey population from which a sample could be selected. Although such an effort is likely to involve considerable costs in both time and financial resources, the committee believes that the addition of evaluators from the government and industrial settings would be of value in providing a different perspective to the reputational assessment and that comparisons between the ratings supplied by academic and nonacademic evaluators would be of particular interest.

Minority Statement

The inclusion of several different and independent possible measures reflecting the quality of graduate education in this report seems to us a substantial addition and a significant improvement to previous such studies. However, we are concerned with the possibility that there are perhaps too many measures, some of which have little or no bearing on the objectives of the present study. In particular, measures 06 and 07 (on the employment plans of graduates) are not informative, have little or nothing to do with the quality of the program, and yield numbers that are not very dependable. Both measures come from data in the NRC's Survey of Earned Doctorates. Measure 06, the fraction of FY1975-79 program graduates with definite employment or study plans at time of doctorate, is vague because the "time of doctorate" may vary considerably from the time of year when, say, academic appointments are offered--and this in turn can vary substantially among institutions. This measure may be associated with the prosperity of the program, but its connection with quality is tenuous. Measure 07, the fraction of FY1975-79 program graduates planning to take positions in Ph.D.-granting universities, is even more nebulous. What is meant by "planning"? How firm are those plans? (We can't know; all there is is a check somewhere on a questionnaire.) What about the variation in quality among different Ph.D.-granting universities? It can be considerable, and such considerable differences are precisely those that the whole study is attempting to measure. Such data obscure the differences. Further, measure 07 betrays the inherent bias of the present study and previous ones in that the "program graduates planning to take positions in Ph.D.-granting universities" is tacitly offered as a measure of the "goodness" of the program. In the late 1970's and 1980's nothing can be farther from the truth. The kindest evaluation of measures 06 and 07 is that they are irrelevant.

These two measures do not result from careful plans made by the committee for this study in order to find other useful new measures. Such plans were considered, but for various good reasons could not be carried out. These two particular measures just happen to be available in the vast data collected and recorded (but not critically evaluated) over the years by the Commission on Human Resources of the

National Research Council. Their inclusion in this report might be explained by bureaucratic inertia, but this inclusion adds nothing to the report.

SAUNDERS MAC LANE

C. K. N. PATEL

ERNEST S. KUH

Appendixes

APPENDIX A

LETTER TO INSTITUTIONAL COORDINATORS

COMMITTEE ON AN ASSESSMENT OF QUALITY-RELATED CHARACTERISTICS
OF RESEARCH-DOCTORATE PROGRAMS IN THE UNITED STATES

Established by the Conference Board of Associated Research Councils

Office of the Staff Director / National Research Council / 2101 Constitution Avenue, N.W. / Washington, D.C. 20418

(202) 389-6552

December 5, 1980

Dear

We are pleased to learn that you have been designated to coordinate the efforts of your institution in assisting our committee with an assessment of the characteristics and effectiveness of research-doctorate programs in U.S. universities. A prospectus describing the goals and procedures for this study has already been distributed to university presidents and graduate deans. The cooperation of universities and their faculties is essential for the assessment to be carried out in an objective and accurate fashion.

The study is being conducted under the aegis of the Conference Board of Associated Research Councils and is housed administratively within the National Research Council. Financial support has been provided by the Andrew W. Mellon Foundation, the Ford Foundation, the National Science Foundation, and the National Institutes of Health. The study will examine more than 2,600 programs in 31 fields in the physical sciences, engineering, life sciences, social sciences, and humanities. Approximately 10,000 faculty members will be asked to evaluate programs in their own fields. In addition to the reputational evaluations by faculty, information will be compiled from national data banks on the achievements of both the faculty involved in each program and the program graduates.

The product of this study will be a series of reports with descriptive data on institutional programs in each of 31 fields to be covered. These reports will present several different measures of the quality-related characteristics of each program being evaluated. Some of the measures will be adjusted for program size. With the cooperation of your institution and that of other universities, we plan to produce these reports by late spring of 1982. At that time the detailed data that have

COMMITTEE MEMBERS

Lyle V. Jones, Co-Chairman
Gardner Lindzey, Co-Chairman
Paul A. Albrecht
Marcus Alexis
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James H. M. Henderson
Ernest S. Kuh
Winfred P. Lehmann
Saunders Mac Lane
Nancy S. Milburn
Lincoln E. Moses
James C. Olson
Kumar Patel
Michael J. Pelczar, Jr.
Jerome B. Schneewind
Duane C. Spriestersbach
Harriet A. Zuckerman

been compiled on research-doctorate programs within your institution will be made available to you for a nominal cost. These data should prove to be quite valuable for an assessment of the particular strengths and weaknesses of individual programs at your institution.

For the past three months the committee has deliberated over what fields are to be covered in the study and which programs within each field are to be evaluated. The financial resources available limit us to an assessment of approximately 2,600 programs in 31 fields. The fields to be included have been determined on the basis of the total number of doctorates awarded by U.S. universities during the FY1976-78 period and the feasibility of identifying and evaluating comparable programs in a particular field. Within each of the 31 fields, programs which awarded more than a specified number of doctorates during the period have been designated for inclusion in the study.

For each of the programs at your institution that are to be evaluated, we ask that you furnish the names and ranks of all faculty members who participate significantly in education toward the research doctorate, along with some basic information (as indicated) about the program itself. A set of instructions and a computer-printed roster (organized by field) are enclosed. In addition, you are given an opportunity to nominate other programs at your institution that are not on the roster, but that you believe have significant distinction and should be included in our evaluation. Any program you nominate must belong in one of the 31 fields covered by the study.

The information supplied by your institution will be used for two purposes. First, a sample of the faculty members identified with each program will be selected to evaluate research-doctorate programs in their fields at other universities. The selection will be made in such a way as to ensure that all institutional programs and faculty ranks are adequately represented in each field category. Secondly, a list of names of faculty and some of the program information you supply will be provided to evaluators selected from other institutions. Thus, it is important that you provide accurate and up-to-date information. You may wish to ask department chairmen or other appropriate persons at your institution to assist in providing the information requested. If you do so, we ask that your office coordinate the effort by collecting the information on each program and sending a single package to us in the envelope provided.

We hope that you will be able to complete this request by December 15. Should you have any questions regarding our request, please call (collect) Porter Coggeshall, the study director, at (202)389-6552. Thank you for your help in this effort.

Sincerely,

Lyle V. Jones

Lyle V. Jones
Co-Chairman

Gardner Lindzey

Gardner Lindzey
Co-Chairman

INSTRUCTIONS

General Instructions

- Provided on the first page of the accompanying roster is a list of the 31 program fields to be covered in this study. Those program fields for which you are requested to furnish information have been designated with an asterisk (*).

- For every designated field there is a separate set of roster pages. Please provide all of the information requested on these pages.

- If your institution offers more than one research-doctorate program in a designated field, we ask that you copy the roster pages furnished for that field category and provide a separate set of information for each program. For example, if your university offers one doctoral program in statistics and another in biostatistics, these should be listed separately. For this purpose, programs offered by different departments (or other administative units) that are advertised as distinct programs in your catalogues would be listed separately. Do not consider different specialty areas within a department to be separate programs.

- If your institution currently does not offer a research-doctorate program in an asterisked field or if, in your judgment, a doctoral program offered fails to fit the designated field category, please so indicate on the roster pages provided for that field.

List of Faculty Members (as of December 1, 1980)

- On each program roster please provide the names of faculty members who participate significantly in doctoral education.

- Included should be individuals who (a) are members of the regular academic faculty (typically holding the rank of assistant, associate, or full professor) and (b) regularly teach doctoral students and/or serve on doctoral committees.

- Members of the faculty who are currently on leave of absence but meet the above criteria should be included.

- Visiting faculty members should not be included.

- Emeritus or adjunct faculty members (or faculty with other comparable ranks) should also be excluded unless they currently participate significantly in doctoral education.

- Members of the faculty who participate significantly in doctoral education in more than one program should be listed on the roster for each program in which they participate.

- In many instances the list of faculty for a program may be identical to an institutional list of graduate faculty.

- Faculty names should be provided in the form in which they are most likely to be recognized by colleagues in the field. We prefer that, within each academic rank, you list faculty alphabetically by last name.

Nomination of Faculty to Serve as Program Evaluators (Column 3 of Faculty Roster)

- Please check the names of at least two faculty members in each academic rank within each program who would be available and, in your opinion, well-qualified to evaluate research-doctorate programs in their field.

- A sample of evaluators will be selected from the list of faculty you provide for each program. In selecting evaluators preference will be given to those whose names you have checked. If no names are checked, a random sample will be selected from the faculty list.

Faculty Who Do Not Hold Ph.D. Degrees From U.S. Universities (Column 4 of Faculty Roster)

- In order to help us match the faculty names you provide with records in the Doctorate Records File (maintained by the National Research Council), we ask that you identify those faculty members who do not hold a Ph.D. or equivalent research-doctorate from a university in the United States.

- This information will be used only for the purposes of collating records and will not be released to those who are selected to evaluate your institution's programs. Nor will this information affect in any way the selection of program evaluators from your institution's faculty.

Nomination of Additional Programs

- We recognize the possibility that we may have omitted one or more research-doctorate programs at your institution that belong to (non-asterisked) fields listed on the first page of the roster and that you believe should be included in this study.

- The last two pages of the accompanying roster are provided for the nomination of an additional program. You are asked to provide the names of faculty and other information about each program you nominate. Should you decide to nominate more than one program, it will be necessary to make additional copies of these two pages of the roster.

- Please restrict your nominations to programs in your institution that you consider to be of uncommon distinction and that have awarded no fewer than two doctorates during the past two years.

- Only programs which fall under one of the 31 field categories listed on the first page of the accompanying roster will be considered for inclusion in the study.

PLEASE RETURN COMPLETED ROSTER IN
THE ENCLOSED ENVELOPE TO:

COMMITTEE ON AN ASSESSMENT OF
QUALITY-RELATED CHARACTERISTICS
OF RESEARCH-DOCTORATE PROGRAMS
NATIONAL RESEARCH COUNCIL, JH-711
2101 CONSTITUTION AVENUE, N.W.
WASHINGTON, D.C. 20418

FIELDS INCLUDED IN THE STUDY

ARTS AND HUMANITIES

* ART HISTORY
* CLASSICS
* ENGLISH LANGUAGE AND LITERATURE
* FRENCH LANGUAGE AND LITERATURE
* GERMAN LANGUAGE AND LITERATURE
LINGUISTICS
MUSIC
* PHILOSOPHY
* SPANISH AND PORTUGUESE LANGUAGE AND LITERATURE

BIOLOGICAL SCIENCES

* BIOCHEMISTRY
BOTANY (INCLUDING PLANT PHYSIOLOGY, PLANT PATHOLOGY, MYCOLOGY)
* CELLULAR BIOLOGY/MOLECULAR BIOLOGY
* MICROBIOLOGY (INCLUDING IMMUNOLOGY, BACTERIOLOGY, PARASITOLOGY, VIROLOGY)
* PHYSIOLOGY (ANIMAL, HUMAN)
ZOOLOGY

ENGINEERING

* CHEMICAL ENGINEERING
* CIVIL ENGINEERING
* ELECTRICAL ENGINEERING
* MECHANICAL ENGINEERING

PHYSICAL SCIENCES

* CHEMISTRY
* COMPUTER SCIENCES
* GEOSCIENCES (INCLUDING GEOLOGY, GEOCHEMISTRY, GEOPHYSICS, GENL EARTH SCI)
* MATHEMATICS
* PHYSICS (EXCLUDING ASTRONOMY, ASTROPHYSICS)
STATISTICS (INCLUDING BIOSTATISTICS)

SOCIAL AND BEHAVIORAL SCIENCES

* ANTHROPOLOGY
* ECONOMICS
* HISTORY
* POLITICAL SCIENCE
* PSYCHOLOGY
* SOCIOLOGY

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* DESIGNATES FIELDS FOR WHICH YOU ARE REQUESTED TO PROVIDE INFORMATION ON RESEARCH-DOCTORATE PROGRAMS IN YOUR INSTITUTION. (SEE INSTRUCTION SHEET REGARDING NOMINATION OF ADDITIONAL PROGRAMS TO BE INCLUDED IN THE STUDY) .

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************************************************************
***                                          - PART A  ***
************************************************************
```

PLEASE ANSWER EACH OF THE FOLLOWING QUESTIONS ABOUT THE RESEARCH-DOCTORATE PROGRAM

IN ____________________________

(1) WHAT IS THE NAME OF THE DEPARTMENT (OR EQUIVALENT ACADEMIC UNIT) IN WHICH THIS RESEARCH-DOCTORATE PROGRAM IS OFFERED ?

....

(2) HOW MANY PH.D.'S (OR EQUIVALENT RESEARCH-DOCTORATES) HAVE BEEN AWARDED IN THE PROGRAM IN EACH OF THE LAST FIVE ACADEMIC YEARS ?

1975-76 ....

1976-77 ....

1977-78 ....

1978-79 ....

1979-80 ....

(3) APPROXIMATELY HOW MANY FULL-TIME AND PART-TIME GRADUATE STUDENTS ENROLLED IN THE PROGRAM AT THE PRESENT TIME (FALL 1980) INTEND TO EARN DOCTORATES ?

FULL-TIME STUDENTS ....

PART-TIME STUDENTS ....

TOTAL ....

(4) IN APPROXIMATELY WHAT YEAR WAS THIS RESEARCH-DOCTORATE PROGRAM INITIATED ? (IF PROGRAM WAS DISCONTINUED AND SUBSEQUENTLY REINSTATED, PLEASE GIVE YEAR IT WAS REINSTATED) .

....

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***********************************************
***  _                             - PART B ***
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(1)	(2)	(3)	(4)
LIST BELOW **ALL FACULTY WHO PARTICIPATE SIGNIFICANTLY IN DOCTORAL EDUCATION** IN THIS PROGRAM (SEE INSTRUCTIONS SHEET). PLEASE PRINT OR TYPE NAMES IN FOLLOWING FORMAT: EXAMPLE: MARY A. JONES A. B. SMITH, JR.	INDICATE THE ACADEMIC RANK OF EACH FACULTY MEMBER (PROF., ASSOC. PROF., ASST. PROF., ETC.).	CHECK BELOW AT LEAST 2 FACULTY IN **EACH** RANK AVAILABLE AND WELL-QUALIFIED TO EVALUATE OTHER PROGRAMS (SEE INSTRUCTIONS SHEET).	CHECK BELOW ANY FACULTY WHO DO **NOT** HOLD A PH.D. OR OTHER RESEARCH-DOCTORATE FROM A **UNIVERSITY IN THE U.S.** (SEE INSTRUCTIONS SHEET).
01	..	( )	( )
02	..	( )	( )
03	..	( )	( )
04	..	( )	( )
05	..	( )	( )
06	..	( )	( )
07	..	( )	( )
08	..	( )	( )
09	..	( )	( )
10	..	( )	( )
11	..	( )	( )
12	..	( )	( )
13	..	( )	( )
14	..	( )	( )
15	..	( )	( )
16	..	( )	( )
17	..	( )	( )
18	..	( )	( )
19	..	( )	( )
20	..	( )	( )

(PART B CONTINUED ON NEXT PAGE)

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APPENDIX B

SURVEY OF EARNED DOCTORATES

(Conducted by the National Research Council under the sponsorship of the National Science Foundation, the Department of Education, the National Institutes of Health, and the National Endowment for the Humanities.)

This annual survey of new recipients of Ph.D. or equivalent research doctorates in all fields of learning contains information describing their demographic characteristics, educational background, graduate training, and postgraduation plans. The source file includes nearly complete data from all 1958-81 doctorate recipients and partial information for all 1920-57 doctoral graduates.

NSF Form 558 1977
OMB No. 99-R0290
Approval Expires June 30, 1979

SURVEY OF EARNED DOCTORATES

This form is to be returned to the GRADUATE DEAN, for forwarding to .... Board on Human-Resource Data and Analyses
Commission on Human Resources
National Research Council
2101 Constitution Avenue, Washington, D. C. 20418

Please print or type.

A. **Name in full:** .... (9-30)
(Last Name) (First Name) (Middle Name)

Cross Reference: Maiden name or former name legally changed .... (31)

B. **Permanent address through which you could always be reached:** (Care of, if applicable) ....
....
(Number) (Street) (City)
....
(State) (Zip Code) (Or Country if not U.S.)

C. **U.S. Social Security Number:** __ __ __ - __ __ - __ __ __ __ (32-40)

D. **Date of birth:** .... **Place of birth:** ....
(41-45) (Month) (Day) (Year) (46-47) (State) (Or Country if not U.S.)

E. **Sex:** 1 ☐ Male 2 ☐ Female (48)

F. **Marital status:** 1 ☐ Married 2 ☐ Not married (including widowed, divorced) (49)

G. **Citizenship:** 0 ☐ U.S. native 2 ☐ Non U.S., Immigrant (Permanent Resident)
1 ☐ U.S. naturalized 3 ☐ Non-U.S., Non-Immigrant (Temporary Resident) (50)
If Non-U.S., indicate country of present citizenship .... (51-52)

H. **Racial or ethnic group:** (Check all that apply.) *A person having origins in —*
0 ☐ American Indian or Alaskan Native .....any of the original peoples of North America, and who maintain cultural identification through tribal affiliation or community recognition.
1 ☐ Asian or Pacific Islander ....any of the original peoples of the Far East, Southeast Asia, the Indian Subcontinent, or the Pacific Islands. This area includes, for example, China, Japan, Korea, the Philippine Islands, and Samoa.
2 ☐ Black, not of Hispanic Origin ....any of the black racial groups of Africa.
3 ☐ White, not of Hispanic Origin ....any of the original peoples of Europe, North Africa, or the Middle East.
4 ☐ Hispanic ....Mexican, Puerto Rican, Central or South American, or other Spanish culture or origins, regardless of race. (53-55)

I. **Number of dependents:** Do not include yourself. (Dependent = someone receiving at least one half of his or her support from you) ....(56)

J. **U.S. veteran status:** 0 ☐ Veteran 1 ☐ On active duty 2 ☐ Non-veteran or not applicable (57)

EDUCATION

K. **High school last attended:** .... (58-59)
(School Name) (City) (State)

Year of graduation from high school: .... (60-61)

L. **List in the table below all collegiate and graduate institutions you have attended including 2-year colleges. List chronologically, and include your doctoral institution as the last entry.**

Institution Name	Location	Years Attended		Major Field		Minor Field	Degree (if any)		
		From	To	Use Specialties List			Title of Degree	Granted	
				Name	Number	Number		Mo.	Yr.

M. **Enter below the title of your doctoral dissertation and the most appropriate classification number and field. If a project report or a musical or literary composition (not a dissertation) is a degree requirement, please check box.** ☐ (44)

Title ....
....
....

Classify using Specialties List
Number .... Name of field ....

N. **Name the department (or interdisciplinary committee, center, institute, etc.) and school or college of the university which supervised your doctoral program:** ....
(Department/Institute/Committee/Program) (School)

O. **Name of your dissertation adviser:** ....
(Last Name) (First Name) (Middle Initial)

continued on next page

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SURVEY OF EARNED DOCTORATES, Cont.

P. Please enter a "1" beside your primary source of support during graduate study. Enter a "2" beside your secondary source of support during graduate study. Check all other sources from which support was received.

58 ___ NSF Fellowship
59 ___ NSF Traineeship
60 ___ NIH Fellowship
61 ___ NIH Traineeship
62 ___ NDEA Fellowship
63 ___ Other HEW
64 ___ AEC/ERDA Fellowship
65 ___ NASA Traineeship
66 ___ GI Bill
67 ___ Other Federal support (specify) ....
68 ___ Woodrow Wilson Fellowship
69 ___ Other U.S. national fellowship (specify) ....
70 ___ University Fellowship
71 ___ Teaching Assistantship
72 ___ Research Assistantship
73 ___ Educational fund of industrial or business firm
74 ___ Other institutional funds (specify) ....
75 ___ Own earnings
76 ___ Spouse's earnings
77 ___ Family contributions
78 ___ Loans (NDSL direct)
79 ___ Other loans
80 ___ Other (specify) ....

Q. Please check the space which most fully describes your status during the year immediately preceding the doctorate.

0 ☐ Held fellowship
1 ☐ Held assistantship
2 ☐ Held own research grant
3 ☐ Not employed
4 ☐ Part-time employed

Full-time Employed in: (Other than 0, 1, 2)
5 ☐ College or university, teaching
6 ☐ College or university, non-teaching
7 ☐ Elem. or sec. school, teaching
8 ☐ Elem. or sec. school, non-teaching
9 ☐ Industry or business
(11) ☐ Other (specify) ....

(12) ☐ Any other (specify) .... (9)

R. How many years (full-time equivalent basis) of professional work experience did you have prior to the doctorate? (include assistantships as professional experience) .... (10-11)

POSTGRADUATION PLANS

S. How well defined are your postgraduation plans?
0 ☐ Have signed contract or made definite commitment
1 ☐ Am negotiating with a specific organization, or more than one
2 ☐ Am seeking appointment but have no specific prospects

3 ☐ Other (specify) .... (12)

T. What are your immediate postgraduation plans?
0 ☐ Postdoctoral fellowship?
1 ☐ Postdoctoral research associateship?
2 ☐ Traineeship?
3 ☐ Other study (specify) ....
} Go to Item "U"
4 ☐ Employment (other than 0, 1, 2, 3)
5 ☐ Military service?
6 ☐ Other (specify) .... (13)
} Go to Item "V"

U. If you plan to be on a postdoctoral fellowship, associateship, traineeship or other study

What will be the field of your postdoctoral study?
Classify using Specialties List.
Number .... Field .... (14-16)

What will be the primary source of support?
0 ☐ U.S. Government
1 ☐ College or university
2 ☐ Private foundation
3 ☐ Nonprofit, other than private foundation
4 ☐ Other (specify)
.... (17)
6 ☐ Unknown
Go to Item "W"

V. If you plan to be employed, enter military service, or other — What will be the type of employer?
0 ☐ 4-year college or university other than medical school
1 ☐ Medical school
2 ☐ Jr. or community college
3 ☐ Elem. or sec. school
4 ☐ Foreign government
5 ☐ U.S. Federal government
6 ☐ U.S. state government
7 ☐ U.S. local government
8 ☐ Nonprofit organization
9 ☐ Industry or business
(11) ☐ Self-employed
(12) ☐ Other (specify) .... (18)

Indicate *primary* work activity with "1" in appropriate box; *secondary* work activity (if any) with "2" in appropriate box.
0 ☐ Research and development
1 ☐ Teaching
2 ☐ Administration
3 ☐ Professional services to individuals
5 ☐ Other (specify) .... (19-20)

In what field will you be working?
Please enter number from Specialties List .... (21-23)

Go to Item "W"

W. What is the name and address of the organization with which you will be associated?

....
(Name of Organization)

....
(Street) (City, State) (Or Country if not U.S.) (24-29)

BACKGROUND INFORMATION

X. Please indicate, by circling the highest grade attained, the education of

your father:	none	1 2 3	4 5 6	7 8	9 10 11	12	1 2 3	4	MA, MD	PhD	Postdoctoral	(30)
		Elementary school			High school		College		Graduate			
your mother	none	1 2 3	4 5 6	7 8	9 10 11	12	1 2 3	4	MA, MD	PhD	Postdoctoral	(31)
	0	1	2	3	4	5	6	7	8	9	(11)	

Signature .... Date completed .... (32-34)

BEST AVAILABLE COPY

APPENDIX C

LETTER TO EVALUATORS

COMMITTEE ON AN ASSESSMENT OF QUALITY-RELATED CHARACTERISTICS
OF RESEARCH-DOCTORATE PROGRAMS IN THE UNITED STATES

Established by the Conference Board of Associated Research Councils

Office of the Staff Director / National Research Council / 2101 Constitution Avenue, N.W. / Washington, D.C. 20418

April 14, 1981

Dear

As you may already know, our committee has undertaken an assessment of research-doctorate programs in U.S. universities. The study is examining approximately 2,650 programs in 31 fields in the arts and humanities, biological sciences, engineering, physical and mathematical sciences, and social sciences. A study prospectus is provided on the reverse of this page. You have been selected from a faculty list furnished by your institution to evaluate programs offering research-doctorates in the field of Chemistry.

On the first page of the attached form is a list of the 145 programs that are being evaluated in this field. These programs produce more than 90 percent of the doctorate recipients in the field. In order to keep the task manageable, you are being asked to consider a randomly selected subset of 50 of these programs. These are designated with an asterisk in the list on the next page and are presented in random sequence on the evaluation sheets that follow. Please read the accompanying instructions carefully before attempting your evaluations.

We ask that you complete the attached survey form and return it in the enclosed envelope within the next three weeks. The evaluations you and your colleagues render will constitute an important component of this study. Your prompt attention to this request will be very much appreciated by our committee.

Sincerely,

Gardner Lindzey

Lyle Jones
For the Study Committee

Enclosures

COMMITTEE MEMBERS

Lyle V. Jones, Co-Chairman
Gardner Lindzey, Co-Chairman
Paul A. Albrecht
Marcus Alexis
Robert M. Bock
Philip E. Converse
James H. M. Henderson
Ernest S. Kuh
Winfred P. Lehmann
Saunders Mac Lane
Nancy S. Milburn
Lincoln E. Moses
James C. Olson
Kumar Patel
Michael J. Pelczar, Jr.
Jerome B. Schneewind
Duane C. Spriestersbach
Harriet A. Zuckerman

RESEARCH-DOCTORATE PROGRAMS IN THE FIELD OF CHEMISTRY
(* DESIGNATES THE PROGRAMS WHICH YOU ARE ASKED TO EVALUATE ON THE FOLLOWING PAGES.)

INSTITUTION - DEPARTMENT/ACADEMIC UNIT

* UNIVERSITY OF AKRON - CHEMISTRY
* UNIVERSITY OF AKRON - POLYMER SCIENCE
UNIVERSITY OF ALABAMA, TUSCALOOSA - CHEMISTRY
AMERICAN UNIVERSITY - CHEMISTRY
* ARIZONA STATE UNIVERSITY, TEMPE - CHEMISTRY
UNIVERSITY OF ARIZONA, TUCSON - CHEMISTRY
* UNIVERSITY OF ARKANSAS, FAYETTEVILLE - CHEMISTRY
* ATLANTA UNIVERSITY - CHEMISTRY
AUBURN UNIVERSITY - CHEMISTRY
BAYLOR UNIVERSITY, WACO - CHEMISTRY
BOSTON COLLEGE - CHEMISTRY
BOSTON UNIVERSITY - CHEMISTRY
BRANDEIS UNIVERSITY - CHEMISTRY
BRIGHAM YOUNG UNIVERSITY - CHEMISTRY
BROWN UNIVERSITY - CHEMISTRY
BRYN MAWR COLLEGE - CHEMISTRY
* CALIFORNIA INSTITUTE OF TECHNOLOGY - CHEMISTRY AND CHEMICAL ENGINEERING
* UNIVERSITY OF CALIFORNIA, BERKELEY - CHEMISTRY
UNIVERSITY OF CALIFORNIA, DAVIS - CHEMISTRY
UNIVERSITY OF CALIFORNIA, IRVINE - CHEMISTRY
* UNIVERSITY OF CALIFORNIA, LOS ANGELES - CHEMISTRY
UNIVERSITY OF CALIFORNIA, RIVERSIDE - CHEMISTRY
UNIVERSITY OF CALIFORNIA, SAN DIEGO - CHEMISTRY
UNIVERSITY OF CALIFORNIA, SANTA BARBARA - CHEMISTRY
UNIVERSITY OF CALIFORNIA, SANTA CRUZ - CHEMISTRY
CARNEGIE-MELLON UNIVERSITY - CHEMISTRY
* CASE WESTERN RESERVE UNIVERSITY - CHEMISTRY
CATHOLIC UNIVERSITY OF AMERICA - CHEMISTRY
UNIVERSITY OF CHICAGO - CHEMISTRY
UNIVERSITY OF CINCINNATI - CHEMISTRY
CUNY, THE GRADUATE SCHOOL - CHEMISTRY
CLARK UNIVERSITY - CHEMISTRY
* CLARKSON COLLEGE OF TECHNOLOGY - CHEMISTRY
CLEMSON UNIVERSITY - CHEMISTRY AND GEOLOGY
COLORADO STATE UNIVERSITY, FT COLLINS - CHEMISTRY
* UNIVERSITY OF COLORADO, BOULDER - CHEMISTRY
* COLUMBIA UNIV-GRAD SCHOOL OF ARTS & SCI - CHEMISTRY
* UNIVERSITY OF CONNECTICUT, STORRS - CHEMISTRY
CORNELL UNIVERSITY, ITHACA - CHEMISTRY
UNIVERSITY OF DELAWARE, NEWARK - CHEMISTRY
* UNIVERSITY OF DENVER - CHEMISTRY
DREXEL UNIVERSITY - CHEMISTRY
* DUKE UNIVERSITY - CHEMISTRY
EMORY UNIVERSITY - CHEMISTRY
GEORGETOWN UNIVERSITY - CHEMISTRY
GEORGIA INSTITUTE OF TECHNOLOGY - CHEMISTRY
UNIVERSITY OF GEORGIA, ATHENS - CHEMISTRY
* HARVARD UNIVERSITY - CHEMISTRY/CHEMICAL PHYSICS
* UNIVERSITY OF HAWAII - CHEMISTRY
UNIVERSITY OF HOUSTON - CHEMISTRY
HOWARD UNIVERSITY - CHEMISTRY
UNIVERSITY OF IDAHO, MOSCOW - CHEMISTRY
ILLINOIS INSTITUTE OF TECHNOLOGY - CHEMISTRY
* UNIV OF ILLINOIS AT URBANA-CHAMPAIGN - CHEMISTRY
UNIVERSITY OF ILLINOIS, CHICAGO CIRCLE - CHEMISTRY
* INDIANA UNIVERSITY, BLOOMINGTON - CHEMISTRY
INST OF PAPER CHEMISTRY (APPLETON, WI) - CHEMISTRY
IOWA STATE UNIVERSITY, AMES - CHEMISTRY
* UNIVERSITY OF IOWA, IOWA CITY - CHEMISTRY
JOHNS HOPKINS UNIVERSITY - CHEMISTRY
KANSAS STATE UNIVERSITY, MANHATTAN - CHEMISTRY
* UNIVERSITY OF KANSAS - CHEMISTRY
UNIVERSITY OF KANSAS - PHARMACEUTICAL CHEMISTRY
KENT STATE UNIVERSITY - CHEMISTRY
UNIVERSITY OF KENTUCKY - CHEMISTRY
LOUISIANA STATE UNIVERSITY, BATON ROUGE - CHEMISTRY
UNIVERSITY OF NEW ORLEANS - CHEMISTRY
UNIVERSITY OF LOUISVILLE - CHEMISTRY
LOYOLA UNIVERSITY OF CHICAGO - CHEMISTRY
UNIVERSITY OF MARYLAND, COLLEGE PARK - CHEMISTRY
* MASSACHUSETTS INSTITUTE OF TECHNOLOGY - CHEMISTRY
* UNIVERSITY OF MASSACHUSETTS, AMHERST - CHEMISTRY
* UNIVERSITY OF MIAMI (FLORIDA) - CHEMISTRY

MICHIGAN STATE UNIVERSITY, EAST LANSING - CHEMISTRY
UNIVERSITY OF MICHIGAN, ANN ARBOR - CHEMISTRY
UNIVERSITY OF MINNESOTA - CHEMISTRY
* UNIVERSITY OF MISSOURI, COLUMBIA - CHEMISTRY
UNIVERSITY OF MISSOURI, KANSAS CITY - CHEMISTRY
UNIVERSITY OF MISSOURI, ROLLA - CHEMISTRY
* MONTANA STATE UNIVERSITY, BOZEMAN - CHEMISTRY
UNIVERSITY OF NEBRASKA, LINCOLN - CHEMISTRY
* UNIVERSITY OF NEW HAMPSHIRE - CHEMISTRY
UNIVERSITY OF NEW MEXICO, ALBUQUERQUE - CHEMISTRY
NEW YORK UNIVERSITY - CHEMISTRY
UNIVERSITY OF NORTH CAROLINA, CHAPEL HILL - CHEMISTRY
* NORTH CAROLINA STATE UNIVERSITY, RALEIGH - CHEMISTRY
* NORTH DAKOTA STATE UNIVERSITY, FARGO - CHEMISTRY/POLYMERS COATINGS
UNIVERSITY OF NORTH DAKOTA, GRAND FORKS - CHEMISTRY
NORTH TEXAS STATE UNIVERSITY, DENTON - CHEMISTRY
NORTHEASTERN UNIVERSITY - CHEMISTRY
NORTHERN ILLINOIS UNIVERSITY, DE KALB - CHEMISTRY
NORTHWESTERN UNIVERSITY - CHEMISTRY
* UNIVERSITY OF NOTRE DAME - CHEMISTRY
* OHIO STATE UNIVERSITY - CHEMISTRY
OHIO UNIVERSITY - CHEMISTRY
* OKLAHOMA STATE UNIVERSITY, STILLWATER - CHEMISTRY
UNIVERSITY OF OKLAHOMA - CHEMISTRY
UNIVERSITY OF OREGON, EUGENE - CHEMISTRY
OREGON STATE UNIVERSITY, COVALLIS - CHEMISTRY
* PENNSYLVANIA STATE UNIVERSITY - CHEMISTRY
UNIVERSITY OF PENNSYLVANIA - CHEMISTRY
UNIVERSITY OF PITTSBURGH - CHEMISTRY
* POLYTECHNIC INSTITUTE OF NEW YORK - CHEMISTRY
PRINCETON UNIVERSITY - CHEMISTRY
PURDUE UNIVERSITY, WEST LAFAYETTE - CHEMISTRY
RENSSELAER POLYTECHNIC INSTITUTE - CHEMISTRY
UNIVERSITY OF RHODE ISLAND - CHEMISTRY
RICE UNIVERSITY - CHEMISTRY
UNIVERSITY OF ROCHESTER - CHEMISTRY
* RUTGERS UNIVERSITY, NEW BRUNSWICK - CHEMISTRY
RUTGERS UNIVERSITY, NEWARK - CHEMISTRY
UNIVERSITY OF SOUTH CAROLINA, COLUMBIA - CHEMISTRY
UNIVERSITY OF SOUTHERN CALIFORNIA - CHEMISTRY
* SOUTHERN ILLINOIS UNIVERSITY, CARBONDALE - CHEMISTRY AND BIOCHEMISTRY
* UNIV OF SOUTHERN MISSISSIPPI, HATTIESBURG - CHEMISTRY
STANFORD UNIVERSITY - CHEMISTRY
UNIVERSITY OF FLORIDA, GAINESVILLE - CHEMISTRY
* FLORIDA STATE UNIVERSITY, TALLAHASSEE - CHEMISTRY
UNIVERSITY OF SOUTH FLORIDA, TAMPA - CHEMISTRY
SUNY AT BINGHAMTON - CHEMISTRY
* SUNY AT BUFFALO - CHEMISTRY
SUNY AT STONY BROOK - CHEMISTRY
* SYRACUSE UNIVERSITY - CHEMISTRY
* SUNY, COL OF ENVIR SCI & FORESTRY (SYRACUSE) - CHEMISTRY
* TEMPLE UNIVERSITY - CHEMISTRY
* UNIVERSITY OF TENNESSEE, KNOXVILLE - CHEMISTRY
TEXAS A&M UNIVERSITY - CHEMISTRY
TEXAS TECH UNIVERSITY, LUBBOCK - CHEMISTRY
UNIVERSITY OF TEXAS, AUSTIN - CHEMISTRY
* TULANE UNIVERSITY - CHEMISTRY
UNIVERSITY OF UTAH, SALT LAKE CITY - CHEMISTRY
UTAH STATE UNIVERSITY, LOGAN - CHEMISTRY AND BIOCHEMISTRY
* VANDERBILT UNIVERSITY - CHEMISTRY
UNIVERSITY OF VERMONT - CHEMISTRY
* VIRGINIA POLYTECHNIC INSTITUTE AND STATE UNIV - CHEMISTRY
* UNIVERSITY OF VIRGINIA - CHEMISTRY
* WASHINGTON STATE UNIVERSITY, PULLMAN - CHEMISTRY
WASHINGTON UNIVERSITY (ST LOUIS) - CHEMISTRY
UNIVERSITY OF WASHINGTON, SEATTLE - CHEMISTRY
WAYNE STATE UNIVERSITY - CHEMISTRY
* WESTERN MICHIGAN UNIVERSITY - CHEMISTRY
UNIVERSITY OF WISCONSIN, MADISON - CHEMISTRY
UNIVERSITY OF WISCONSIN, MILWAUKEE - CHEMISTRY
UNIVERSITY OF WYOMING - CHEMISTRY
* YALE UNIVERSITY - CHEMISTRY

INSTRUCTIONS

At the top of the next page please provide the information requested on the highest degree you hold and your current field of specialization. You may be assured that all information you furnish on the survey form is to be used for purposes of statistical description only and that the confidentiality of your responses will be protected.

On the pages that follow you are asked to judge 50 programs (presented in random sequence) that offer the research-doctorate. Each program is to be evaluated in terms of: (1) scholarly quality of program faculty; (2) effectiveness of program in educating research scholars/scientists; and (3) change in program quality in the last five years (see below). Although the assessment is limited to these factors, our committee recognizes that other factors are relevant to the quality of doctoral programs, and that graduate programs serve important purposes in addition to that of educating doctoral candidates.

A list of the faculty members signficantly involved in each program, the name of the academic unit in which the program is offered, and the number of doctorates awarded in that program during the last five years have been printed on the survey form (whenever available). Although this information has been furnished to us by the institution and is believed to be accurate, it has not been verified by our study committee and may have a few omissions, misspellings, or other errors.

Before marking your responses on the survey form, you may find it helpful to look over the full set of programs you are being asked to evaluate. In making your judgments about each program, please keep in mind the following instructions:

(1) Scholarly Quality of Program Faculty. Check the box next to the term that most closely corresponds to your judgment of the quality of faculty in the research-doctorate program described. Consider only the scholarly competence and achievements of the faculty. It is suggested that no more than five programs be designated "distinguished."

(2) Effectiveness of Program in Educating Research Scholars/Scientists. Check the box next to the term that most closely corresponds to your judgment of the doctoral program's effectiveness in educating research scholars/scientists. Consider the accessibility of the faculty, the curricula, the instructional and research facilities, the quality of graduate students, the performance of the graduates, and other factors that contribute to the effectiveness of the research-doctorate program.

(3) Change in Program Quality in Last Five Years. Check the box next to the term that most closely corresponds to your estimate of the change that has taken place in the research-doctorate program in the last five years. Consider both the scholarly quality of the program faculty and the effectiveness of the program in educating research scholars/scientists. Compare the quality of the program today with its quality five years ago--not the change in the program's relative standing among other programs in the field.

In assessing each of these factors, mark the category "Don't know well enough to evaluate" if you are unfamiliar with that aspect of the program. It is quite possible that for some programs you may be knowledgeable about the scholarly quality of the faculty, but not about the effectiveness of the program or change in program quality.

For each of the programs identified, you are also asked to indicate the extent to which you are familiar with the work of members of the program faculty. For example, if you recognize only a very small fraction of the faculty, you should mark the category "Little or no familiarity."

Please be certain that you have provided a set of responses for each of the programs identified on the following pages. The fully completed survey form should be returned in the enclosed envelope to:

Committee on an Assessment of Quality-Related
Characteristics of Research-Doctorate Programs
National Research Council, JH-638
2101 Constitution Avenue, N.W.
Washington, D.C. 20418

Our committee will be most appreciative of your thoughtful assessment of these research-doctorate programs. We welcome any comments you may wish to append to the completed survey form.

PLEASE PROVIDE THE FOLLOWING INFORMATION: **FORM NO. SAMP-66**

HIGHEST DEGREE YOU HOLD: ( ) PH.D. ( ) OTHER (PLEASE SPECIFY): ______________________

YEAR OF HIGHEST DEGREE: ________

INSTITUTION OF HIGHEST DEGREE: ____________________________

YOUR CURRENT FIELD OF SPECIALIZATION (CHECK ONLY ONE):

A. ( ) ANALYTICAL CHEMISTRY
B. ( ) BIOCHEMISTRY
C. ( ) INORGANIC CHEMISTRY
D. ( ) ORGANIC CHEMISTRY
E. ( ) PHARMACEUTICAL CHEMISTRY
F. ( ) PHYSICAL CHEMISTRY
G. ( ) POLYMER CHEMISTRY
H. ( ) THEORETICAL CHEMISTRY
I. ( ) CHEMISTRY, GENERAL
J. ( ) OTHER (PLEASE SPECIFY):

____

INSTITUTION: **UNIVERSITY OF ARKANSAS, FAYETTEVILLE** **FORM NO. SAMP-01**
DEPARTMENT/ACADEMIC UNIT: **CHEMISTRY**
TOTAL DOCTORATES AWARDED 1976-80: 32

PROFESSORS: Robbin C. ANDERSON, George D. BLYHOLDER, A. Wallace CORDES, Arthur J. FRY, James F. HINTON, Lester C. HOWICK, Dale A. JOHNSON, P. K. KURODA, Walter L. MEYER, Francis S. MILLETT, Lothar SCHAFER, Samuel SIEGEL, Leslie B. SIMS, John A. THOMA

ASSOCIATE PROFESSORS: Collis R. GEREN

ASSISTANT PROFESSORS: Neil T. ALLISON, Danny J. DAVIS, Bill DURHAM, Robert B. GREEN, Roger E. KOEPPE, David W. PAUL, Norbert J. PIENTA

SCHOLARLY QUALITY OF PROGRAM FACULTY

1. ( ) DISTINGUISHED
2. ( ) STRONG
3. ( ) GOOD
4. ( ) ADEQUATE
5. ( ) MARGINAL
6. ( ) NOT SUFFICIENT FOR DOCTORAL EDUCATION

0. ( ) DON'T KNOW WELL ENOUGH TO EVALUATE

FAMILIARITY WITH WORK OF PROGRAM FACULTY

1. ( ) CONSIDERABLE FAMILIARITY
2. ( ) SOME FAMILIARITY
3. ( ) LITTLE OR NO FAMILIARITY

EFFECTIVENESS OF PROGRAM IN EDUCATING RESEARCH SCHOLARS/SCIENTISTS

1. ( ) EXTREMELY EFFECTIVE
2. ( ) REASONABLY EFFECTIVE
3. ( ) MINIMALLY EFFECTIVE
4. ( ) NOT EFFECTIVE

0. ( ) DON'T KNOW WELL ENOUGH TO EVALUATE

CHANGE IN PROGRAM QUALITY IN LAST FIVE YEARS

1. ( ) BETTER THAN FIVE YEARS AGO
2. ( ) LITTLE OR NO CHANGE IN LAST FIVE YEAR
3. ( ) POORER THAN FIVE YEARS AGO

0. ( ) DON'T KNOW WELL ENOUGH TO EVALUATE

INSTITUTION: SUNY, COL OF ENVIR SCI & FORESTRY (SYRACUSE) **FORM NO. SAMP-02**
DEPARTMENT/ACADEMIC UNIT: CHEMISTRY
TOTAL DOCTORATES AWARDED 1976-80: 21

PROFESSORS: Robert T. LALONDE, John A. MEYER, Anatole SARKO, Conrad SCHUERCH, Robert M. SILVERSTEIN, Johannes SMID, Kenneth J. SMITH Jr, Stuart W. TANENBAUM, Tore E. TIMELL

ASSOCIATE PROFESSORS: Paul M. CALUWE, Wilbur M. CAMPBELL, Michael FLASHNER, Gideon LEVIN

ASSISTANT PROFESSORS: David L. JOHNSON

SCHOLARLY QUALITY OF PROGRAM FACULTY

1. ( ) DISTINGUISHED
2. ( ) STRONG
3. ( ) GOOD
4. ( ) ADEQUATE
5. ( ) MARGINAL
6. ( ) NOT SUFFICIENT FOR DOCTORAL EDUCATION

0. ( ) DON'T KNOW WELL ENOUGH TO EVALUATE

FAMILIARITY WITH WORK OF PROGRAM FACULTY

1. ( ) CONSIDERABLE FAMILIARITY
2. ( ) SOME FAMILIARITY
3. ( ) LITTLE OR NO FAMILIARITY

EFFECTIVENESS OF PROGRAM IN EDUCATING RESEARCH SCHOLARS/SCIENTISTS

1. ( ) EXTREMELY EFFECTIVE
2. ( ) REASONABLY EFFECTIVE
3. ( ) MINIMALLY EFFECTIVE
4. ( ) NOT EFFECTIVE

0. ( ) DON'T KNOW WELL ENOUGH TO EVALUATE

CHANGE IN PROGRAM QUALITY IN LAST FIVE YEARS

1. ( ) BETTER THAN FIVE YEARS AGO
2. ( ) LITTLE OR NO CHANGE IN LAST FIVE YEAR
3. ( ) POORER THAN FIVE YEARS AGO

0. ( ) DON'T KNOW WELL ENOUGH TO EVALUATE

INSTITUTION: VIRGINIA POLYTECHNIC INSTITUTE AND STATE UNIV **FORM NO. SAMP-03**
DEPARTMENT/ACADEMIC UNIT: CHEMISTRY
TOTAL DOCTORATES AWARDED 1976-80: 55

PROFESSORS: H. J. ACHE, L. K. BRICE Jr, A. F. CLIFFORD, R. F. DESSY, J. G. DILLARD, J. D. GRAYBEAL M. HUDLICKY, D. G. KINGSTON, J. G. MASON, J. E. MCGRATH, H. M. MCNAIR, M. A. OGLIARUSO, J. C. SCHUG, L. T. TAYLOR, J. P. WIGHTMAN, J. F. WOLFE

ASSOCIATE PROFESSORS: H. M. BELL, H. C. DORN, P. E. FIELD, G. SANZONE, H. D. SMITH, T. C. WARD

ASSISTANT PROFESSORS: B. R. BARTSCHMID, H. D. FINKLEA, B. E. HANSON, P. J. HARRIS, R. A. HOLTON, J. W. VIERS

OTHER STAFF: D. G. LARSEN, F. M. VANDAMME

SCHOLARLY QUALITY OF PROGRAM FACULTY

1. ( ) DISTINGUISHED
2. ( ) STRONG
3. ( ) GOOD
4. ( ) ADEQUATE
5. ( ) MARGINAL
6. ( ) NOT SUFFICIENT FOR DOCTORAL EDUCATION

0. ( ) DON'T KNOW WELL ENOUGH TO EVALUATE

FAMILIARITY WITH WORK OF PROGRAM FACULTY

1. ( ) CONSIDERABLE FAMILIARITY
2. ( ) SOME FAMILIARITY
3. ( ) LITTLE OR NO FAMILIARITY

EFFECTIVENESS OF PROGRAM IN EDUCATING RESEARCH SCHOLARS/SCIENTISTS

1. ( ) EXTREMELY EFFECTIVE
2. ( ) REASONABLY EFFECTIVE
3. ( ) MINIMALLY EFFECTIVE
4. ( ) NOT EFFECTIVE

0. ( ) DON'T KNOW WELL ENOUGH TO EVALUATE

CHANGE IN PROGRAM QUALITY IN LAST FIVE YEARS

1. ( ) BETTER THAN FIVE YEARS AGO
2. ( ) LITTLE OR NO CHANGE IN LAST FIVE YEAR
3. ( ) POORER THAN FIVE YEARS AGO

0. ( ) DON'T KNOW WELL ENOUGH TO EVALUATE

APPENDIX D

THE ARL LIBRARY INDEX

(SOURCE: Mandel, Carol A., and Mary P. Johnson, ARL Statistics 1979-80, Association of Research Libraries, Washington, D.C., 1980, pp. 23-24.)

The data tables at the beginning of the ARL Statistics display figures reported by ARL member libraries in 22 categories that, with the exception of the measures of interlibrary loan activity, describe the size of ARL libraries in terms of holdings, expenditures, and personnel. The rank order tables provide an overview of the ranges and medians for 14 of these categories, or variables, among ARL academic libraries as well as quantitatively comparing each library with other ARL member institutions. However, none of the 22 variables provides a summary measure of a library's relative size within ARL or characterizes the ARL libraries as a whole.

The ARL Library Index has been derived as a means of providing this summary characterization, permitting quantitative comparisons of ARL academic libraries, singly and as a group, with other academic libraries. Through the use of statistical techniques known as factor analysis, it can be determined that 15 of the variables reported to ARL are more closely correlated with each other than with other categories. Within this group of 15 variables, some are subsets or combinations of materials. When the subsets and combinations are eliminated, 10 variables emerge as characteristic of ARL libary size. These are: volumes held, volumes added (gross), microform units held, current serials received, expenditures for library materials, expenditures for binding, total salary and wage expenditures, other operating expenditures, number of professional staff, and number of nonprofessional staff.

These 10 categories delineate an underlying dimension, or factor, of library size. By means of principal component analysis, a technique that is a variant of factor analysis, it is possible to calculate the correlations of each of the variables with this hypothetical factor of library size. From this analysis a weight for each variable can be determined based on how closely that variable is correlated with the overall dimension of library size defined by all 10 categories. A high correlation indicates that much of the variation in ARL library size is accounted for by the variable in question, implying a characteristic in which ARL libraries are relatively alike. The component score coefficients, or weights, for

the 1979-80 ARL academic library data are as follows:

Volumes held	.12108
Volumes added (gross)	.11940
Microforms held	.07509
Current serials received	.12253
Expenditures for library materials	.12553
Expenditures for binding	.11266
Expenditures for salaries and wages	.12581
Other operating expenditures	.10592
Number of professional staff	.12347
Number of nonprofessional staff	.11297

From these weights an individual library can compute an index score that will indicate its relative position among ARL libraries with respect to the overall factor of library size. The data for each of the 10 variables are converted to standard normal form and multiplied by the appropriate weight. The resulting scores are expressed in terms of the number of standard deviations above or below the mean index score for ARL academic libraries. Thus, the formula* for calculating a library's 1979-80 index score is as follows:

.12108 (log of volumes held - 6.2916)/.2172
+.11940 (log of volumes added gross - 4.8412)/.2025
+.07509 (log of microforms - 6.0950)/.1763
+.12253 (log of current serials - 4.3432)/.2341
+.12553 (log of expenditures for materials - 6.2333)/.1636
+.11266 (log of expenditures for binding - 5.0480)/.2475
+.12581 (log of total salaries - 6.4675)/.2103
+.10592 (log of operating expenditures - 5.6773)/.2635
+.12347 (log of professional staff - 1.8281)/.1968
+.11297 (log of nonprofessional staff - 2.1512)/.2046

The index scores for the 99 academic libraries that were members of ARL during 1979-80 are shown on the following page. It is important to emphasize that these scores are only a summary description of library size, distributing ARL libraries along a normal curve, based on 10 quantitative measures that are positively correlated with one another in ARL libraries. The scores are in no way a qualitative assessment of the collections, services, or operations of these libraries.

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*For calculation on a hand calculator, the formula can be mathematically simplied to: (.55746 x log of volumes held) + (.58963 x log of volumes added gross) + (.42592 x log of microforms) + (.52341 x log of current serials) + (.76730 x log of expenditures for materials) + (.45519 x log of expenditures for binding) + (.59824 x log of total salries) + (.40197 x log of operating expenditures) + (.62739 x log of professional staff) + (.55215 x log of nonprofessional staff) - 26.79765.

APPENDIX E

FACULTY RESEARCH SUPPORT

The names of National Science Foundation (NSF) research grant awardees were obtained from a file maintained by the NSF Division of Information Systems. The file provided to the committee covered all research grant awards made in FY1978, FY1979, and FY1980 and included the names of the principal investigator and co-principal investigators for each award. Also available from this file was information concerning the field of science/engineering of the research grant and the institution with which the investigator was affiliated. This information was used in identifying which research grant recipients were on the program faculty lists provided by institutional coordinators.

The names of National Institutes of Health (NIH) and Alcohol, Drug Abuse, and Mental Health Administration (ADAMHA) research grant recipients (principal investigators only) were obtained from the NIH Information for Management Planning, Analysis, and Coordination System. This system contains a detailed record of all applications and awards in the various training and research support programs of these agencies. For the purposes of this study, information analogous to that available from the NSF file was extended for FY1978-80 research grant awardees and their records were matched with the program faculty lists. Measure 13 constitutes the fraction of program faculty members who had received one or more research grant awards from NSF (including both principal investigators and co-principal investigators), NIH, or ADAMHA during the FY1978-80 period.

R&D EXPENDITURES

Total university expenditures for R&D activities are available from the NSF Survey of Scientific and Engineering Expenditures at Universities and Colleges. A copy of the survey form appears on the following pages.

NSF FORM 411 (Dec 1979)

FORM APPROVED
OMB No. 99-R0279

NATIONAL SCIENCE FOUNDATION
Washington, D.C. 20550

SURVEY OF SCIENTIFIC AND ENGINEERING EXPENDITURES AT UNIVERSITIES AND COLLEGES, FY 1979

(Current and Capital Expenditures for Research, Development, and Instruction in the Sciences and Engineering)

Organizations are requested to complete and return this form to:

NATIONAL SCIENCE FOUNDATION
1800 G Street, N.W.
Washington, D.C. 20550
Attn: UNISG

This form should be returned by February 1, 1980. Your cooperation in returning the survey questionnaire promptly is very important.

Financial data are requested for your institution's 1979 fiscal year.

This information is solicited under the authority of the National Science Foundation Act of 1950, as amended. All information you provide will be used for statistical purposes only. Your response is entirely voluntary and your failure to provide some or all of the information will in no way adversely affect your institution.

All financial data requested on this form should be reported in thousands of dollars; for example, an expenditure of $25,342 should be rounded to the nearest thousand dollars and reported as $25.

Where exact data are not available, estimates are acceptable. Your estimates will be better than ours.

Please correct if name or address has changed

(Includes aggregate data from 567 universities and colleges but excludes 19 university-administered FFRDC's)

Include data for branches and all organizational units of your institution, such as medical schools and agricultural experiment stations. Also include hospitals or clinics owned, operated, or controlled by universities, and integrated operationally with the clinical programs of your medical schools. Exclude data for federally funded research and development centers (FFRDC's). A separate questionnaire is included in this package if your institution administers an FFRDC. **If you have any questions please contact Jim Hoehn (202-634-4674).**

Please enter the beginning and ending dates of your institution's fiscal year for which you are reporting on this form:

________________ through ________________

Please note in space below:
(1) Any suggestions to improve the design of the survey questionnaire, (2) any suggestions to improve the instructions, or (3) any comments on significant change in R&D in your institution.

(Attach additional sheets, if necessary.)

PLEASE TYPE OR PRINT NAME OF PERSON SUBMITTING THIS FORM	TITLE	AREA CODE	EXCH	NO.	EXT
NAME OF PERSON WHO PREPARED THIS SUBMISSION (If different from above)	TITLE	AREA CODE	EXCH	NO.	EXT
Please check and correct if necessary the name and address of your institution shown on the mailing label.		DATE			

ITEM 1. CURRENT EXPENDITURES FOR SEPARATELY BUDGETED RESEARCH AND DEVELOPMENT (R&D) IN THE SCIENCES AND ENGINEERING, BY SOURCE OF FUNDS AND BASIC RESEARCH, FY 1979 (Include indirect costs)

ITEMS 1. & 2. INSTRUCTIONS

Separately budgeted research and development (R&D) includes all funds expended for activities specifically organized to produce research outcomes and commissioned by an agency either external to the institution or separately budgeted by an organizational unit within the institution. **Include** equipment purchased under research project awards as part of "current funds." Research funds subcontracted to outside organizations should also be included. **Exclude** training grants, public service grants, demonstration projects, etc.

Under a. **Federal Government.** Report grants and contracts for R&D by all agencies of the Federal Government including indirect costs from these sources.

Under b. **State and local governments.** Include funds for R&D from State, county, municipal, or other local governments and their agencies. Include here State funds which support R&D at agricultural experiment stations.

Under c. **Industry.** Include all grants and contracts for R&D from profitmaking organizations, whether engaged in production, distribution, research, service, or other activities. Do not include grants and contracts from nonprofit foundations financed by industry, which should be reported under **All other sources.**

Under d. **Institutional funds.** Report funds which your institution spent for R&D activities including indirect costs from the following sources. (1) General-purpose State or local government appropriations; (2) general-purpose grants from industry, foundations, or other outside sources; (3) tuition and fees; (4) endowment income. In addition, estimate your institution's contribution to unreimbursed indirect costs incurred in association with R&D projects financed by outside organizations, and mandatory cost sharing on Federal and other grants. To estimate unreimbursed indirect costs, many institutions use a university-wide negotiated indirect cost rate multiplied by the base (e.g., direct salaries and wages, etc.) minus actual indirect cost recoveries. If your institution now separately budgets what was previously classified as departmental research, these data should be included in line d.

Under e. **All other sources.** Include foundations and voluntary health agencies grants for R&D, as well as all other sources not elsewhere classified. Funds from foundations which are affiliated with or grant solely to your institution should be included under d. Institutional funds. Funds for R&D received from a health agency that is a unit of a State or local government should be reported under State and local governments. Also include gifts from individuals that are restricted by the donor to research.

Please exclude from your response any R&D expenditures in the fields of education, law, humanities, music, the arts, physical education, library science, and all other nonscience fields.

Source of funds		(1) Total R&D expenditures	(2) Basic research
		(Dollars in thousands)	(Percent of column 1)
a. Federal Government	1110	$ 3,431,538	73.4 %
*b. State and local governments	1125	467,311	**Basic research** is directed toward an increase of knowledge; it is research where the primary aim of the **investigator** is a fuller knowledge or understanding of the subject under study rather than a practical application thereof.
c. Industry	1150	193,794	
d. Institutional funds	1160	716,241	
(1) Separately budgeted	1161	357,926	
(2) Underrecovery of indirect costs and cost sharing	1162	358,315	
*e. All other sources	1175	373,845	
f. TOTAL (sum of a through e)	1100	$ 5,182,729	68.5 %

CONFIDENTIALITY

Information received from individual institutions in lines 1161 and 1162, or estimates for basic research expenditures, will not be published or released; only aggregate totals will appear in publications.

*Combined data cell (See instructions for b and e).

Total R&D expenditures reported in line 1100 column (1) and line 1400 column (1) should be the same.
Federally financed R&D expenditures reported in line 1100 column (1) and line 1400 column (2) should be the same.

ITEM 2. TOTAL AND FEDERALLY FINANCED EXPENDITURES FOR SEPARATELY BUDGETED RESEARCH AND DEVELOPMENT, BY FIELD OF SCIENCE, FY 1979 (Include indirect costs and equipment).

Field of science	Illustrative disciplines		(Dollars in thousands)	
			(1) Total	(2) Federal
a. ENGINEERING (TOTAL)	Aeronautical, agricultural, chemical, civil, electrical, industrial, mechanical, metallurgical, mining, nuclear, petroleum, bio- and biomedical, energy, textile, architecture	1410	$ 715,454	$ 474,866
b. PHYSICAL SCIENCES (TOTAL)		1420	559,566	448,992
(1) Astronomy	Astrophysics, optical and radio, x-ray, gamma-ray, neutrino	1421	39,026	26,862
(2) Chemistry	Inorganic, organo-metallic, organic, physical, analytical, pharmaceutical, polymer science (exclude biochemistry)	1422	204,062	154,031
(3) Physics	Acoustics, atomic and molecular, condensed matter, elementary particles, nuclear structure, optics, plasma	1423	275,680	236,872
(4) Other	Used for multidisciplinary projects within physical sciences and for disciplines not requested separately	1424	40,798	31,227
c. ENVIRONMENTAL SCIENCES (TOTAL)	ATMOSPHERIC SCIENCES: Aeronomy, solar weather modification, meteorology, extra-terrestrial atmospheres GEOLOGICAL SCIENCES: Engineering geophysics, geology, geodesy, geomagnetism, hydrology, geochemistry, paleomagnetism, paleontology, physical geography, cartography, seismology, soil sciences OCEANOGRAPHY: Chemical, geological, physical, marine geophysics, marine biology, biological oceanography	1430	429,129	307,493
d. MATHEMATICAL AND COMPUTER SCIENCES (TOTAL)		1440	145,087	94,534
(1) Mathematics	Algebra, analysis, applied mathematics, foundations and logic, geometry, numerical analysis, statistics, topology	1441	65,637	49,043
(2) Computer sciences	Design, development, and application of computer capabilities to data storage and manipulation, information science	1442	79,450	45,491
e. LIFE SCIENCES (TOTAL)		1450	2,814,824	1,810,729
(1) Biological sciences	Anatomy, biochemistry, biophysics, biogeography, ecology, embryology, entomology, genetics, immunology, microbiology, nutrition, parasitology, pathology, pharmacology, physical anthropology, physiology, botany, zoology	1451	949,993	690,805
(2) Agricultural	Agricultural chemistry, agronomy, animal science, conservation, dairy science, plant science, range science, wildlife	1452	565,697	168,849
(3) Medical	Anesthesiology, cardiology, endocrinology, gastroenterology, hematology, neurology, obstetrics, opthalmology, preventive medicine and community health, psychiatry, radiology, surgery, veterinary medicine, dentistry, pharmacy	1453	1,214,442	890,612
(4) Other	Used for multidisciplinary projects within life sciences	1454	84,692	60,463
f. PSYCHOLOGY (TOTAL)	Animal behavior, clinical, educational, experimental, human development and personality, social	1460	99,732	72,256
g. SOCIAL SCIENCES (TOTAL)		1470	290,057	153,674
(1) Economics	Econometrics, international, industrial, labor, agricultural, public finance and fiscal policy	1471	85,415	40,641
(2) Political science	Regional studies, comparative government, international relations, legal systems, political theory, public administration	1472	39,029	18,452
(3) Sociology	Comparative and historical, complex organizations, culture and social structure, demography, group interactions, social problems and welfare, theory	1473	72,669	46,739
(4) Other	History of science, cultural anthropology, linguistics, socio-economic geography	1474	92,944	47,842
h. OTHER SCIENCES, n.e.c. (TOTAL)*	To be used when the multidisciplinary and interdisciplinary aspects make the classification under one primary field impossible	1480	128,880	68,994
i. TOTAL (SUM of a through h) Check to insure that column totals are identical with data reported in item 1.		1400	5,182,729	3,431,538

*PLEASE EXCLUDE FROM YOUR RESPONSE ANY R&D EXPENDITURES IN THE FIELDS OF EDUCATION, LAW, HUMANITIES, MUSIC, THE ARTS, PHYSICAL EDUCATION, LIBRARY SCIENCE, AND ALL OTHER NONSCIENCE FIELDS.

ITEM 3. CAPITAL EXPENDITURES FOR SCIENTIFIC AND ENGINEERING FACILITIES AND EQUIPMENT FOR RESEARCH, DEVELOPMENT, AND INSTRUCTION, BY FIELD OF SCIENCE AND SOURCE OF FUNDS, FY 1979

ITEM 3. INSTRUCTIONS

Report funds for facilities which were in process or completed during FY 1979. Expenditures for administration buildings, steam plants, residence halls, and other such facilities should be excluded unless utilized principally for research, development, or instruction in engineering or in the sciences. Land costs should be **excluded**. Exclude small equipment items in your current fund account costing approximately $300 or less per unit or as recommended by the Joint Accounting Group (JAG) or as determined by your institutional policy; these are to be reported under items 1 and 2.

Facilities and equipment expenditures **include** the following (a) Fixed equipment such as built-in equipment and furnishings; (b) movable scientific equipment such as oscilloscopes and pulse-height analyzers; (c) movable furnishings such as desk, (d) architect's fees, site work, extension of utilities, and the building costs of service functions such as integral cafeterias and bookstores of a facility; (e) facilities constructed to house separate components such as medical schools and teaching hospitals; and (f) special separate facilities used to house scientific apparatus such as accelerators, oceanographic vessels, and computers.

Field of science		(Dollars in thousands)		
		Total (1)	Federal (2)	All other sources (3)
a. Engineering	1710	$ 95,399	$ 22,060	$ 73,339
b. Physical sciences	1720	64,551	32,439	32,112
c. Environmental sciences	1730	25,293	8,970	16,323
d. Mathematical and computer sciences	1740	27,465	3,049	24,416
e. Life sciences	1750	456,477	92,567	363,910
f. Psychology	1760	7,803	1,767	6,036
g. Social sciences	1770	20,932	2,069	18,863
h. Other sciences, n.e.c.	1780	31,984	5,054	26,930
i. Total (sum of a through h)	1700	$ 729,904	$ 167,975	$ 561,929

APPENDIX F

DATA ON PUBLICATION RECORDS

Data for these measures were provided by a subcontractor, Computer Horizons, Inc. A detailed description of the derivation of these measures and examples of their use is given in:

> Francis Narin, Evaluative Bibliometrics: The Use of Publications and Citations Analysis in the Evaluation of Scientific Activity, Report to the National Science Foundation, March 1976.

The following pages have been excerpted from Chapters VI and VII of this report and describe operational considerations in compiling the publication records included here (measure 15) and the methodology used in determining the "influence" of published articles (measure 16).

VI. OPERATIONAL CONSIDERATIONS

A. Basics of Publication and Citation Analysis

The first section of this chapter discusses the major stages of publication and citation analysis techniques in evaluative bibliometrics. Later sections of the chapter consider publication and citation count parameters in further detail, including discussions of data bases, of field-dependent characteristics of the literature, and of some cautions and hazards in performing citation analyses for individual scientists.

The basic stages which must be kept in mind when doing a publication or citation analysis are briefly summarized in Figure 6-1.

1. Type of Publication

For a publication analysis the fundamental decision is which type of publication to count. A basic count will include all regular scientific articles. However, notes are often counted since some engineering and other journals often contain notes with significant technical content. Reviews may be included. Letters-to-the-editor must also be considered as a possible category for inclusion, since some important journals are sometimes classified as letter journals. For example, publications in Physical Review Letters were classified as letters by the Science Citation Index prior to 1970, although they are now classified as articles.

For most counts in the central core of the scientific literature, articles, notes and reviews are used as a measure of scientific output. When dealing with engineering fields, where many papers are presented at meetings accompanied by reprints and published proceedings, meeting presentations must also be considered. In some applied fields, i.e., agriculture, aerospace and nuclear engineering, where government support has been particularly comprehensive, the report literature may also be important. Unfortunately, reports generally contain few references, and citations to them are limited so they are not amenable to the normal citation analyses.

Books, of course, are a major type of publication, especially in the social sciences where they are often used instead of a series of journal articles. In bibliometrics a weighting of n articles equal to one book is frequently used; no uniformly acceptable value of n is available. A few of the papers discussed in Chapter V contain such measures.

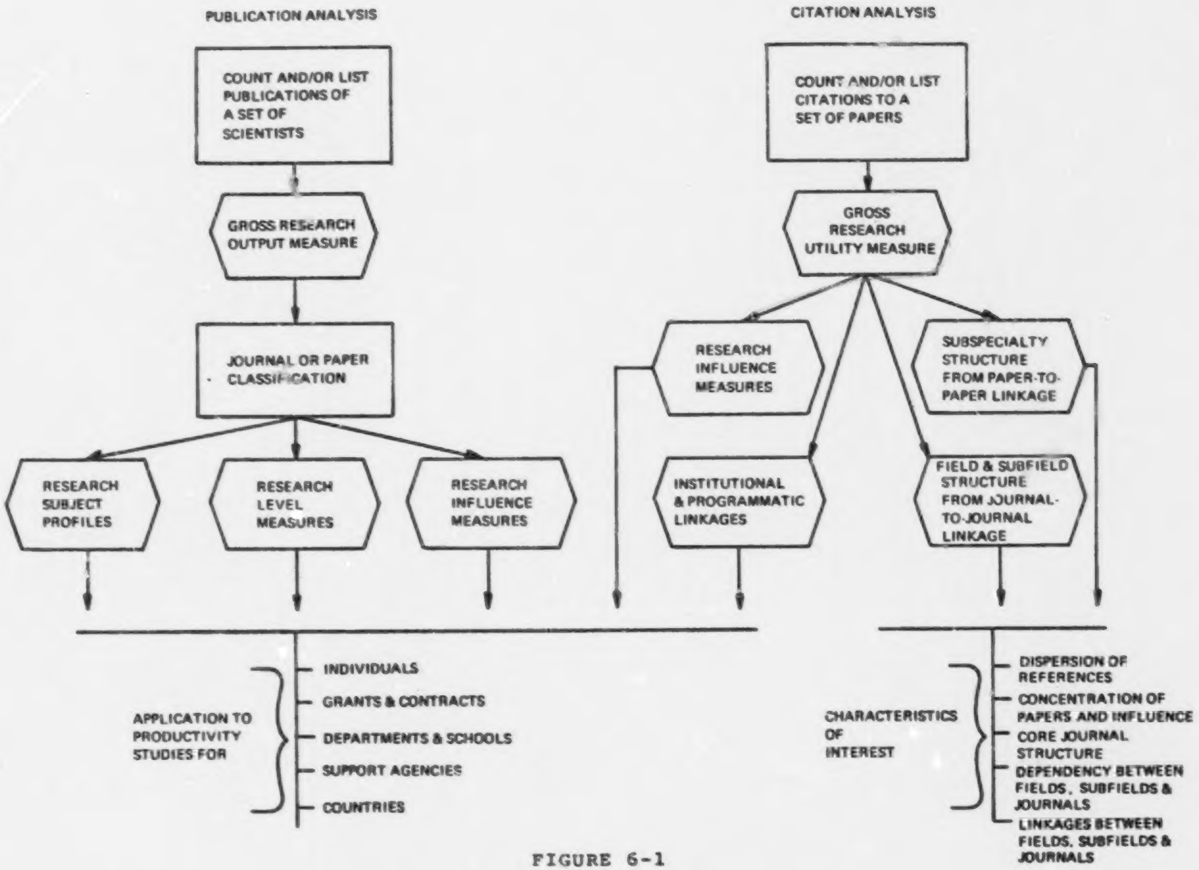
PUBLICATION ANALYSIS
COUNT AND/OR LIST PUBLICATIONS OF A SET OF SCIENTISTS
GROSS RESEARCH OUTPUT MEASURE
JOURNAL OR PAPER CLASSIFICATION
RESEARCH SUBJECT PROFILES
RESEARCH LEVEL MEASURES
RESEARCH INFLUENCE MEASURES
APPLICATION TO PRODUCTIVITY STUDIES FOR
INDIVIDUALS
GRANTS & CONTRACTS
DEPARTMENTS & SCHOOLS
SUPPORT AGENCIES
COUNTRIES
CITATION ANALYSIS
COUNT AND/OR LIST CITATIONS TO A SET OF PAPERS
GROSS RESEARCH UTILITY MEASURE
RESEARCH INFLUENCE MEASURES
SUBSPECIALTY STRUCTURE FROM PAPER-TO-PAPER LINKAGE
INSTITUTIONAL & PROGRAMMATIC LINKAGES
FIELD & SUBFIELD STRUCTURE FROM JOURNAL-TO-JOURNAL LINKAGE
CHARACTERISTICS OF INTEREST
DISPERSION OF REFERENCES
CONCENTRATION OF PAPERS AND INFLUENCE
CORE JOURNAL STRUCTURE
DEPENDENCY BETWEEN FIELDS, SUBFIELDS & JOURNALS
LINKAGES BETWEEN FIELDS, SUBFIELDS & JOURNALS

FIGURE 6-1

STAGES OF PUBLICATION AND CITATION ANALYSIS

2. Time Spans

A second important decision in making a publication count is to select the time span of interest. In the analysis of the publications of an institution a fixed time span, usually one year or more, is most appropriate. In comparing publication histories of groups of scientists, their professional ages (normally defined as years since attaining the PhD degree) must be comparable so that the build-up of publications at the beginning of a career or the decline at the end will not complicate the results. A typical scientist's first publication appears soon after his dissertation; if he continued working as a scientist, his publications may continue for thirty or more years.

The accurate control of the time span of a count is not as trivial as it might seem. Normally, the publication count is made from secondary sources (abstracting or indexing services) rather than from scanning the publications individually. Since most abstracting and indexing sources have been expanding their coverage over time, any publication count covering more than a few years must give careful consideration to changes in coverage. Furthermore, the timeliness of the secondary sources varies widely, with sources dependent on outside abstractors lagging months or even years behind. Since these abstracting lags may depend upon language, field and country of origin, they are a particular problem in international publication counts.

The Science Citation Index is one of the most current secondary sources, with some 80% to 90% of a given year's publications in the SCI for that year.

Of course, no abstracting or indexing service can be perfect, since some journals are actually published months after their listed publication dates. Nevertheless, variations in timeliness are large from one service to another.

3. Comprehensiveness of Source Coverage

An important consideration in making a publication count is the comprehensiveness of the source coverage. Most abstracting and indexing sources cover some journals completely, cover other journals selectively, and omit some journals in their field of interest. The Science Citation Index is an exception in that it indexes each and every important entry from any journal it covers. This is one of the major advantages in using the SCI as a data base. Chemical Abstracts and Biological Abstracts have a group of journals which they abstract completely, coupled with a much larger set of journals from which they abstract selectively, based upon the appropriateness of the article to the subject coverage. In some cases the abstractor or indexer may make a quality judgment, based on his estimate of the importance or the quality of the article or upon his

knowledge of whether similar information has appeared elsewhere; Excerpta Medica is a comprehensive abstracting service for which articles are included only if they meet the indexers' quality criteria.

Some data on the extent of coverage of the major secondary sources is presented in Section D of this chapter.

4. Multiple Authorships and Affiliations

Attributing credits for multiple authorships and affiliations is a significant problem in publication and citation analysis. In some scientific papers the authors are listed alphabetically; in others the first author is the primary author; still others use different conventions. These conventions have been been discussed by Crane[1] and by other social scientists.[2] There does not seem to be any reasonable way to deal with the attribution problem, except to attribute a fraction of a publication to each of the authors. For example, an article which has three authors would have one-third of an article attributed to each author. The amount of multiple authorship unfortunately differs from country to country and from field to field. Several studies have investigated the problem, but no comprehensive data exists.[3]

Multiple authorship takes on particular importance when counting an individual's publications since membership on a large research team may lead to a single scientist being a co-author of ten or more publications per year. This number of publications is far in excess of the normal publication rate of one to two articles per year per scientist.

Multiple authorship problems arise less often in institutional publication counts since there are seldom more than one or two institutions involved in one publication.

A particularly vexing aspect of multiple authorship is the first author citation problem: almost all citations are to the first author in a multi-authored publication. As a result, a researcher who is second author of five papers may receive no

citations under his own name, even though the papers he co-authored may be highly cited. Because of this, a citation count for a person must account for the citations which appear under the names of the first authors of publications for which the author of interest was a secondary author. This can lead to a substantial amount of tedious additional work, since a list of first authors must be generated for all of the subjects' multi-authored papers. Citations to each of these first authors must then be found, the citations of interest noted, and these citations fractionally attributed to the original author. Since multiple years of the Citation Index are often involved, the amount of clerical work searching from volume to volume and from author to author, and citation to citation can be quite large.

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[1] Diana Crane, "Social Structure in a Group of Scientists: A Test of the 'Invisible College' Hypothesis," American Sociological Review 34 (June 1969):335-352.

[2] James E. McCauly, "Multiple Authorship," Science 141 (August 1963):579.

Beverly L. Clark, "Multiple Authorship Trends in Scientific Papers," Science 143 (February 1964):822-824.

[3] Harriet Zuckerman, "Nobel Laureates in Science: Patterns of Productivity, Collaboration, and Authorship," American Sociolgoical Review 32 (June 1967):391-403.

A note of caution about the handling of multiple authorship in the Corporate Index of the Science Citation Index: SCI lists a publication giving all the corporate affiliations, but always with the first author's name. Thus a publication by Jones and Smith where Jones is at Harvard and Smith is at Yale would be listed in the Corporate Index under Harvard with the name Jones and also under Yale with the name Jones. To find the organization with which the various authors are affiliated, the original article must be obtained.

Although the publisher of the Science Citation Index, the Institute for Scientific Information, tries to maintain a consistent policy in attributing institutional affiliations, when authors have multiple affiliations the number of possible variants is large. In the SCI data base on magnetic tape, sufficient information is included to assign a publication with authors from a number of different institutions in a reasonably fair way to those institutions; however, in the printed Corporate Index, one has to refer to the Source Index to find the actual number of authors, or to the paper itself to find the affiliations of each of the authors.

5. Completeness of Available Data

Another consideration in a publication analysis is the completeness of data available in the secondary source, since looking up hundreds or thousands of publications individually is tedious and expensive. One difficulty here is that most of the abstracting and indexing sources are designed for retrieval and not for analysis. As a result, some of the parameters which are of greatest analytical importance, such as the affiliation of the author and his source of financial support, are often omitted. Furthermore, some of the abstracting sources are cross-indexed in complex ways, so that a publication may only be partially described at any one point, and reference must be made to a companion volume to find even such essential data as the author's name. While intellectually trivial, these

searches can be exceedingly time consuming when analyzing large numbers of publications.

The specific data which are consistently available in the secondary sources are the basic bibliographic information: i.e., authors' name, journal or report title, volume, page, etc. This information is the basic data used for retrieval, and since the abstracting and indexing services are retrieval oriented, this bibliographic information is always included.

Data which are less consistently available in the secondary source are the authors' affiliation and the authors' rank or title. Both of these are of interest in analysis. For example, the ranking of universities based on publication in a given subject area is often of interest. This ranking can be tabulated only from a secondary source which gives the authors' university affiliation.

6. Support Acknowledgements

The source of the authors' financial support is seldom given in any secondary source, although it is now being added to the MEDLARS data base. Since this financial data can be used to define the fraction of a subject literature which is being supported by a particular corporate body such as a governmental agency, the data are of substantial evaluative interest.

The amount of acknowledgement of agency support in the scientific literature has changed over time. In a Computer Horizons study completed in 1973 the amount of agency support acknowledgement was tabulated in twenty major journals from five different fields.[4] Table 6-1 summarizes those support acknowledgements for 1969 and 1972.

In 1969, only 67% of the articles in 20 major journals acknowledged financial support. By 1972, the percentage of articles acknowledging financial support had risen to approximately 85%. The table shows that the sources of support differ from one field to another and also shows that the fields of interest to these sources differ as well. For example, the National Science Foundation is the major source of acknowledged support in mathematics, while the National Institutes of Health clearly dominate the support of biology. Chemistry is the field with the largest amount of non-government (private sector) support in the U.S.

Note also that the 20 journals used were major journals in their fields; as less prestigious journals are examined, the amount of support acknowledgement generally decreases.

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[4] Computer Horizons, Inc., Evaluation of Research in the Physical Sciences Based on Publications and Citations, Washington, D.C., National Science Foundation, Contract No. NSF-C627, November, 1973.

TABLE 6-1

AGENCY SUPPORT ACKNOWLEDGEMENTS IN 20 LEADING JOURNALS FROM 5 MAJOR FIELDS - 1969 and 1972

Agency Acknowledged	Mathematics 1969	1972	Physics 1969	1972	Chemistry 1969	1972	Biochemistry 1969	1972	Biology 1969	1972	All Fields 1969	1972
NSF	18%	37%	14%	19%	18%	21%	8%	8%	8%	8%	13%	16%
NIH	2	1	1	1	11	10	37	39	23	32	13	16
AEC	1	1	21	15	10	8	3	2	3	2	11	8
DOD	15	7	19	15	10	10	1	1	2	3	10	9
NASA	1	1	7	9	2	2	1	1	1	2	3	4
Other U.S. Government	1	2	1	2	2	2	1	1	1	3	1	2
Other U.S.	3	10	3	14	8	21	10	10	9	13	7	14
Foreign	5	4	5	15	7	8	16	25	10	24	8	16
Unacknowledged	55	37	31	11	32	18	25	13	42	14	33	15

In an attempt to account for the 15% of unacknowledged papers, a questionnaire was sent to all U.S. authors in the 1972 sample who did not acknowledge agency support. Almost 70% of the authors who had not listed sources of support responded to the questionnaire. Of the authors who responded, over two-thirds were supported by their institutions as part of their regular duties; approximately 20% of the respondents cited specific governmental agencies as sources of support, even though they had not acknowledged these in the article itself. Twelve percent of the respondents listed no agency or institutional support; research done as fulfillment of graduate studies was included in this category.

Overall, the 1972 tabulation and survey showed that 88% of the research reported in these prestigious journals was externally supported, and that 97% of the externally supported work was acknowledged as such.

7. Subject Classification

Having constructed a basic list of publications, the next step in analysis is normally to subject classify the publications. Either the journals or the papers themselves may be classified. When a large number of papers is to be analyzed, classification of the papers by the field of the journal can be very convenient. Such a classification implies, of course, a degree of homogeneity of publication which is normally adequate when analyzing hundreds of papers. Such a classification may not be sufficient for the analysis of the scientific publications of one or a few individuals.

Subject classification schemes differ from one abstracting and indexing service to another. Therefore, a comparison of a collection of papers based on the classification schemes of more than one abstracting and indexing service is almost hopeless. A classification of papers at the journal level has been used in the influence methodology discussed in Chapters VII through X.

8. Citation Counts

Citation counts are a tool in evaluative bibliometrics second in importance only to the counting and classification of publications. Citation counts may be used directly as a measure of the utilization or influence of a single publication or of all the publications of an individual, a grant, contract, department, university, funding agency or country. Citation counts may be used to link individuals, institutions, and programs, since they show how one publication relates to another publication.

In addition to these evaluative uses, citations also have important bibliometric uses, since the references from one paper to another define the structure of the scientific literature. Chapter III discusses how this type of analysis may be carried out at a detailed, micro-level to define closely related papers through bibliographic coupling and co-citation. That chapter also describes how citation analysis may be used at a macro-level to link fields and subfields through journal-to-journal mapping. The bibliometric characteristics of the literature also provide a numeric base against which evaluative parameters may be normalized.

Some of the characteristics of the literature which are revealed by citation analysis are noted on Figure 6-1. These characteristics include:

> The dispersion of references: a measure of scientific "hardness", since in fields that are structured and have a central core of accepted knowledge, literature references tend to be quite concentrated.
>
> The concentration of papers and influence: another measure of centrality in a field, dependent upon whether or not a field has a core journal structure.
>
> The hierarchic dependency relationships between field, subfield and journals, including the comparison of numbers of references from field A to field B, compared with number of references from field B to field A: this comparison provides a major justification for the pursuit of basic research as a foundation of knowledge utilized by more applied areas.
>
> The linkages between fields, subfields and journals: a measure of the flow of information, and of the importance of one sector of the scientific mosaic to another.

VII. THE INFLUENCE METHODOLOGY

A. Introduction

In this chapter an influence methodology will be described which allows advanced publication and citation techniques to be applied to institutional aggregates of publications, such as those of departments, schools, programs, support agencies and countries, without performing an individual citation count. In essence, the influence procedure ascribes a weighted average set of properties to a collection of papers, such as the papers in a journal, rather than determining the citation rate for the papers on an individual basis.

The influence methodology is completely general, and can be applied to journals, subfields, fields, institutions or countries.

There are three separate aspects of the influence methodology which are particularly pertinent to journals. These are

1. A subject classification for each journal
2. A research type (level) classification for the biomedical journals, and
3. Citation influence measures for each journal.

It is the third of these, the citation influence measures, which add a quality or utilization aspect to the analysis. The influence methodology assumes that, although citations to papers vary within a given journal, aggregates of publications can be characterized by the influence measures of the journals in which they appear. Chapter IX discusses this assumption in some detail.

Older measures of influence all suffer from some defect which limits their use as evaluative measures.

The total number of publications of an individual, school or country is a measure of total activity only; no inferences concerning importance may be drawn.

The total number of citations to a set of publications, while incorporating a measure of peer group recognition, depends on the size of the set involved and has no meaning on an absolute scale.

The journal "impact factor" introduced by Garfield is a size-independent measure, since it is defined as the ratio of the number of citations the journal receives to the number of publications in a specified earlier time period.[1] This

measure, like the total number of citations, has no meaning on an absolute scale. In addition the impact factor suffers from three more significant limitations. Although the size of the journal, as reflected in the number of publications, is corrected for, the average length of individual papers appearing in the journal is not. Thus, journals which publish longer papers, namely review journals, tend to have higher impact factors. In fact the nine highest impact factors obtained by Garfield were for review journals. This measure can therefore not be used to establish a "pecking order" for journal prestige.

---

[1] Eugene Garfield, "Citation Analysis As a Tool in Journal Evaluation," Science 178 (November 3, 1972):471.

The second limitation is that the citations are unweighted, all citations being counted with equal weight, regardless of the citing journal. It seems more reasonable to give higher weight to a citation from a prestigious journal than to a citation from a peripheral one. The idea of counting a reference from a more prestigious journal more heavily has also been suggested by Kochen.[2]

A third limitation is that there is no normalization for the different referencing characteristics of different segments of the literature: a citation received by a biochemistry journal, in a field noted for its large numbers of references and short citation times, may be quite different in value from a citation in astronomy, where the overall citation density is much lower and the citation time lag much longer.

In this section three related influence measures are developed, each of which measures one aspect of a journal's influence, with explicit recognition of the size factor. These measures are:

(1) The influence weight of the journal: a size-independent measure of the weighted number of citations a journal receives from other journals, normalized by the number of references the journal gives to other journals.

(2) The influence per publication for the journals: the weighted number of citations each article, note or review in a journal receives from other journals.

(3) The total influence of the journal: the influence per publication times the total number of publications.

---

[2] M.Kochen, Principles of Information Retrieval, (New York: John Wiley & Sons, Inc. 1974), 83.

B. Development of the Weighting Scheme

1. The Citation Matrix

A citation matrix may be used to describe the interactions among members of a set of publishing entities. These entities may, for example, be journals, institutions, individuals, fields of research, geographical subdivisions or levels of research methodology. The formalism to be developed is completely general in that it may be applied to any such set. To emphasize this generality, a member of a set will be referred to as a unit rather than as a specific type of unit such as a journal.

The citation matrix is the fundamental entity which contains the information describing the flow of influence among units.

The matrix has the form

$$C = \begin{pmatrix} c_{11} & c_{12} & \ldots & c_{1n} \\ c_{21} & c_{22} & \ldots & c_{2n} \\ \vdots & \vdots & & \vdots \\ c_{n1} & c_{n2} & \ldots & c_{nn} \end{pmatrix}$$

A distinction is made between the use of the terms "reference" and "citation" depending on whether the issuing or receiving unit is being discussed. Thus, a term C_{ij} in the citation matrix indicates both the number of references unit i gives to unit j and the number of citations unit j receives from unit i.

The time frame of a citation matrix must be clearly understood in order that a measure derived from it be given its proper interpretation. Suppose that the citation data are based on references issued in 1973. The citations received may be to papers in any year up through 1973. In general, the papers issuing the references will not be the same as those receiving the citations. Thus, any conclusions drawn from such a matrix assume an on-going, relatively constant nature for each of the units. For instance, if the units of study are journals, it is assumed that they have not changed in size relative to each other and represent a constant subject area. Journals in rapidly changing fields and new journals would therefore have to be treated with caution.

A citation matrix for a specific time lag may also be formulated. This would link publications in one time period with publications in some specified earlier time period.

2. Influence Weights

For each unit in the set a measure of the influence of that unit will be extracted from the citation matrix. Because total influence is clearly a size-dependent quantity, it is essential to distinguish between a size-independent measure of influence, to be called the influence weight, and the size-dependent total influence.

To make the idea of a size-independent measure more precise, the following property of such a measure may be specified: if a journal were randomly subdivided into smaller entities, each entity would have the same measure as the parent journal.

The citation matrix may be thought of as an "input-output" matrix with the medium of exchange being the citation. Each unit gives out references and receives citations; it is above average if it has a "positive citation balance", i.e., receives more than it gives out. This reasoning provides a first order approximation to the weight of each unit, which is

$$W_i^{(1)} = \frac{\text{total number of citations to the ith unit from other units}}{\text{total number of references from the ith unit to other units}}.$$

This is the starting point for the iterative procedure for the calculation of the influence weights to be described below.

The denominator of this expression is the row sum

$$S_i = \sum_{j=1}^{n} C_{ij}$$

corresponding to the ith unit of the citation matrix; it may be thought of as the "target size" which this unit presents to the referencing world.

The influence weight, W_i, of the ith unit is defined as

$$W_i = \sum_{k=1}^{n} \frac{W_k \quad C_{ki}}{S_i}$$

In the sum, the number of cites to the ith unit from the kth unit is weighted by the weight of kth (referencing) unit. The number of cites is also divided by the target size S_i of

the unit i being cited. The n equations, one for each unit, provide a self consistent "bootstrap" set of relations in which each unit plays a role in determining the weight of every other unit. The following summarizes the derivation of those weights.

The equations defining the weights,

$$w_i = \sum_{k=1}^{n} \frac{w_k \quad c_{ki}}{s_i}, \qquad i = 1,\ldots,n \qquad (1)$$

are a special case of a more general system of equations which may be written in the form

$$\left(\sum_{k=1}^{n} w_k \gamma_{ki} \right) - \lambda w_i = 0, \qquad i = 1,\ldots,n \qquad (2)$$

Here $\gamma_{ki} = \frac{c_{ki}}{s_i}$ and Equation 1 is shown to be

a special case of Equation 2 corresponding to $\lambda = 1$. As will be explained shortly the system of equations given in (1) will not, in general, possess a non-zero solution; only for certain values of λ called the eigenvalues of the system, will there be non-zero solutions.

With the choice of target size s_i, the value $\lambda = 1$ is in fact an eigenvalue so that Equation 1 itself does possess a solution.

Using the notation γ^T for the transpose of γ,

$\gamma^T_{ik} = \gamma_{ki}$; introducing the Kronecker delta symbol

defined by $\delta_{ik} = \begin{cases} 1 & i = k \\ 0 & i \neq k \end{cases}$

the equation can then be written

$$\sum_{k=1}^{n} \left(\gamma^{T}_{ik} - \lambda\,\delta_{ik}\right) w_k = 0 \ . \qquad (3)$$

This is a system of n homogeneous equations for the weights. In order that a solution for such a system exists, the determinant of the coefficients must vanish. This gives an nth order equation for the eigenvalues

$$\begin{vmatrix} \gamma_{11}-\lambda & \gamma_{21} \ . \ . \ . \ . & \gamma_{n1} \\ \gamma_{12} & \gamma_{22}-\lambda \ . \ . \ . & \gamma_{n2} \\ \vdots & \vdots & \vdots \\ \gamma_{1n} & \gamma_{2n} \ . \ . \ . \ . & \gamma_{nn}-\lambda \end{vmatrix} = 0 \qquad (4)$$

called the characteristic equation.

Only for values of λ which satisfy this equation, does a non-zero solution for the W's exist. Moreover, Equation 3 does not determine the values of the w_k themselves, but at best determines their ratios. Equivalently the eigenvalue equation may be thought of as a vector equation for the vector unknown $\underline{w} = \left\{w_1, \ldots, w_n\right\}$

$$\underline{\gamma}^{T} \cdot \underline{w} = \lambda\,\underline{w} \qquad (5)$$

from which it is clear that only the direction of $\underline{w}$ is determined.

The normalization or scale factor is then fixed by the condition that the size-weighted average of the weights is 1, or

$$\frac{\sum_{1}^{n} s_k \; w_k}{\sum_{1}^{n} s_k} = 1 \tag{6}$$

This normalization assures that the weight values have an absolute as well as a relative meaning, with the value 1 representing an average value.

Each root of the characteristic equation determines a solution vector or eigenvector of the equation, but the weight vector being sought is the eigenvector corresponding to the largest eigenvalue. This can be seen from the consideration of an alternative procedure for solving the system of equations, a procedure which also leads to the algorithm of choice.

Consider an iterative process starting with equal weights for all units. The values $W_i^{(0)} = 1$ can be thought of as zeroth order approximations to the weights. The first order weights are then

$$w_i^{(1)} = \frac{\sum_{k=1}^{n} c_{ki}}{S_i}$$

This ratio (total cites to a unit divided by the target size of the unit) is the simplest size-corrected citation measure and, in fact, corresponds to the impact measure used by Garfield. These values are then substituted into the right hand side of Equation 1 to obtain the next order of approximation. In general, the mth order approximation is

$$W_i^{(m)} = \sum_{k=1}^{n} \frac{W_k^{(m-1)} C_{ki}}{S_i} = \sum_{k=1}^{n} W_k^{(m-1)} \times \gamma_{ki} = \sum_{j=1}^{n} \left(\gamma\right)^{m}_{ji}$$

The exact weights are therefore

$$W_i = W_i^{(\infty)} = \sum_{j=1}^{n} \left(\lim_{m \to \infty} \gamma^m\right)_{ji}$$

This provides the most convenient numerical procedure for finding the weights, the whole iteration procedure being reduced to successive squarings of the γ matrix.

This procedure is closely related to the standard method for finding the dominant eigenvalue of a matrix. Since $\lambda = 1$ is the largest eigenvalue, repeated squarings are all that is needed. If the largest eigenvalue had a value other than 1, the normalization condition, Equation 6, would have to be reimposed with each squaring. Convergence to three decimal places usually occurs with six squarings,corresponding to raising γ to the 64th power.

APPENDIX G

CONFERENCE ON THE ASSESSMENT OF QUALITY OF GRADUATE EDUCATION PROGRAMS

September 27-29, 1976
Woods Hole, Massachusetts

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SUMMARY

September 27-29, 1976, Woods Hole, Massachusetts

Report of the Conference

A substantial majority of the Conference believes that the earlier assessments of graduate education have received wide and important use: by students and their advisors, by the institutions of higher education as aids to planning and the allocation of educational functions, as a check of unwarranted claims of excellence, and in social science research.

The recommendations which follow attempt to distill the main points of consensus within the conference. This report does not in any sense adequately represent the rich diversity of points of view revealed during the Conference nor the deep and real differences in belief among the participants.

Recommendations

1. A new assessment of graduate programs is needed, and we believe that the Conference Board is an appropriate sponsor. While we do not propose to specify the details of this assessment, we are prepared to suggest the following guidelines.

2. The assessment should include a modified replication of the Roose-Andersen study, with the addition of some fields and the subdivision of others.

3. It is important to provide additional indices relevant to program assessment such as some of those cited by Breneman, Drew, and Page. The Conference directs specific attention to the CGS/ETS Study currently nearing completion and urges that the results of that study be carefully examined and used to the fullest possible extent.

4. The initial assessment study should be one of surveying the quality of scholarship and research and the effectiveness of Ph.D. programs in the fields selected for inclusion.

    a. It is intended that the study be carried forward on a continuing basis to provide valuable longitudinal data. This should be implemented along the lines suggested by Moses, involving annual assessment of subsets of programs.

    b. Every eligible institution should be given the choice of whether to be included in the study.

    c. Each program is to be characterized by a set of scores, one for each selected index. The presentation of scores for all

reported indices should be accompanied by a discussion of their substantive meaning. In addition, appropriate measures of uncertainty should accompany all tables of results.

5. We propose a simultaneous study exploring ways of reviewing goals of graduate education other than research and scholarship. This would involve review of other doctoral programs and selected master's programs.

APPENDIX H

PLANNING COMMITTEE FOR THE STUDY OF THE QUALITY OF RESEARCH-DOCTORATE PROGRAMS

September 1978

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California Institute of
Technology

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The John Simon Guggenheim
Memorial Foundation

Harriet A. Zuckerman
Co-Chairman
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APPENDIX I

REGION AND STATE CODES FOR THE UNITED STATES AND POSSESSIONS (and U.S. Government)

REGION 1 - NEW ENGLAND

11	Maine
12	New Hampshire
13	Vermont
14	Massachusetts
15	Rhode Island
16	Connecticut

REGION 2 - MIDDLE ATLANTIC

21	New York
22	New Jersey
23	Pennsylvania

REGION 3 - EAST NORTH CENTRAL

31	Ohio
32	Indiana
33	Illinois
34	Michigan
35	Wisconsin

REGION 4 - WEST NORTH CENTRAL

41	Minnesota
42	Iowa
43	Missouri
44	North Dakota
45	South Dakota
46	Nebraska
47	Kansas

REGION 5 - SOUTH ATLANTIC

51	Delaware
52	Maryland
53	District of Columbia
54	Virginia
55	West Virginia
56	North Carolina
57	South Carolina
58	Georgia
59	Florida

REGION 6 - EAST SOUTH CENTRAL

61	Kentucky
62	Tennessee
63	Alabama
64	Mississippi

REGION 7 - WEST SOUTH CENTRAL

71	Arkansas
72	Louisiana
73	Oklahoma
74	Texas

REGION 8 - MOUNTAIN

81	Montana
82	Idaho
83	Wyoming
84	Colorado
85	New Mexico
86	Arizona
87	Utah
88	Nevada

REGION 9 - PACIFIC

90	Guam
91	Washington
92	Oregon
93	California
94	Alaska
95	Hawaii
96	Virgin Islands
97	Panama Canal Zone
98	Puerto Rico

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An Assessment of Research-Doctorate Programs in the United States: *Humanities*

Committee on an Assessment of Quality-Related Characteristics of Research-Doctorate Programs in the United States

Lyle V. Jones, Gardner Lindzey, and
Porter E. Coggeshall, *Editors*

Sponsored by

The Conference Board of Associated Research Councils

American Council of Learned Societies
American Council on Education
National Research Council
Social Science Research Council

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NOTICE: The project that is the subject of this report was approved by the Conference Board of Associated Research Councils, whose members are drawn from the American Council of Learned Societies, the American Council on Education, the National Research Council, and the Social Science Research Council. The members of the committee responsible for the report were chosen for their special competences and with regard for appropriate balance.

This report has been reviewed by a group other than the authors and editors according to procedures approved by each of the four member Councils of the Conference Board.

The Conference Board of Associated Research Councils was created to foster discussion of issues of mutual interest; to determine the extent to which a common viewpoint on such issues prevails within the academic community of the United States; to foster specific investigations when so desired; and, when the Conference Board finds joint, common, or other action desirable, to make recommendations to the appropriate Councils.

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The committee is most appreciative of the cooperation it received from individuals in the 228 universities participating in the assessment. In particular we thank the university presidents and chancellors who agreed to participate and offered the assistance of staff members at their institutions; the graduate deans, department chairmen, and many other university personnel who helped to compile information about the research-doctorate programs at their own institutions; and the nearly 5,000 faculty members who took the time to complete and return reputational survey forms. This assessment would not have been feasible without the participation of these individuals. Nor would it have been complete without the suggestions from many individuals within and outside the academic community who reviewed the study plans and committee reports.

The committee also acknowledges the contributions of Francis Narin and Paul R. McAllister, whose innovative work in the area of publication productivity in science and engineering fields has been a valuable resource. We thank H. Roberts Coward and his colleagues at

the Institute for Scientific Information for their help in compiling publications data as well as William Batchelor and John James at NIH and David Staudt at NSF for their help in acquiring data on individual research grant awards.

Within the National Research Council many individuals have assisted in the planning and completion of this project. Robert A. Alberty, Harrison Shull, and W. K. Estes, former chairmen of the Commission on Human Resources, and William C. Kelly, Executive Director of the commission (now the Office of Scientific and Engineering Personnel), offered assistance and helpful counsel during all phases of the study. Lindsey R. Harmon and C. Alan Boneau contributed greatly to the planning of the assessment.

To Porter E. Coggeshall, Study Director, the committee expresses thanks for a job extremely well done. His ability to translate the committee's directions into compiled data and analyses must be given a large share of the credit for the completion of this project. He has been ably assisted by Prudence W. Brown, who supervised the data collection activities; Dorothy G. Cooper, who provided excellent secretarial support; George A. Boyce, whose programming expertise was invaluable; and Kathleen Drennan and Linda Dix, who helped in preparing final copy of the manuscript.

Committee on an Assessment of Quality-Related
Characteristics of Research-Doctorate Programs
in the United States

Preface

The genius of American higher education is often said to be in the close association of training and research--that is, in the nation's research-doctorate programs. Consequently, we are not surprised at the amount of worried talk about the quality of the research doctorate, for deterioration at that level will inevitably spread to wherever research skills are needed--and that indeed is a far-flung network of laboratories, institutes, firms, agencies, bureaus, and departments. What might surprise us, however, is the imbalance between the putative national importance of research-doctorate programs and the amount of sustained evaluative attention they themselves receive.

The present assessment, sponsored by the Conference Board of Associated Research Councils--comprised of the American Council of Learned Societies, the American Council on Education, the National Research Council (NRC), and the Social Science Research Council--seeks to correct the imbalance between worried talk and systematic study. In this effort the Conference Board continues a tradition pioneered by the American Council on Education, which in 1966 published An Assessment of Quality in Graduate Education, the report of a study conducted by Allan M. Cartter, and in 1970 published A Rating of Graduate Programs, by Kenneth D. Roose and Charles J. Andersen. The Cartter and Roose-Andersen reports have been widely used and frequently cited.

Some years after the release of the Roose-Andersen report, it was decided that the effort to assess the quality of research-doctorate programs should be renewed, and the Conference Board of Associated Research Councils agreed to sponsor an assessment. The Board of Directors of the American Council on Education concurred with the notion that the next study should be issued under these broader auspices. The NRC agreed to serve as secretariat for a new study. The responsible staff of the NRC earned the appreciation of the Conference Board for the skill and dedication shown during the course of securing funding and implementing the study. Special mention should also be made of the financial contribution of the National Academy of Sciences which, by supplementing funds available from external sources, made it possible for the study to get under way.

To sponsor a study comparing the quality of programs in 32

disciplines and from more than 200 doctorate-granting universities is to invite critics, friendly and otherwise. Such was the fate of the previous studies; such has been the fate of the present study. Scholarship, fortunately, can put criticism to creative use and has done so in this project. The study committee appointed by the Conference Board reviewed the criticisms of earlier efforts to assess research-doctorate programs, and it actively solicited criticisms and suggestions for improvements of its own design. Although constrained by limited funds, the committee applied state-of-the-art methodology in a design that incorporated the lessons learned from previous studies as well as attending to many critics of the present effort. Not all criticism has thus been stilled; nor could it ever be. Additional criticisms will be voiced by as many persons as begin to use the results of this effort in ways not anticipated by its authors. These criticisms will be welcome. The Conference Board believes that the present study, building on earlier criticisms and adopting a multidimensional approach to the assessment of research-doctorate programs, represents a substantial improvement over past reports. Nevertheless, each of the diverse measures used here has its own limitations, and none provides a precise index of the quality of a program for educating students for careers in research. No doubt a future study, taking into account the weaknesses as well as strengths of this effort, will represent still further improvement. One mark of success for the present study would be for it to take its place in a continuing series, thereby contributing to the indicator base necessary for informed policies that will maintain and perhaps enhance the quality of the nation's research-doctorate programs.

For the more immediate future the purposes of this assessment are to assist students and student advisers seeking the best match possible between individual career goals and the choice of an advanced degree program; to serve scholars whose study site is higher education and the nation's research enterprise; and to inform the practical judgment of the administrators, funders, and policymakers responsible for protecting the quality of scholarly education in the United States.

A remarkably hard-working and competent group, whose names appear on page vii of this report, oversaw the long process by which this study moved from the planning stage to the completion of these reports. The Conference Board expresses its warmest thanks to the members of its committee and especially to their co-chairmen, Lyle V. Jones and Gardner Lindzey.

Conference Board of Associated
Research Councils

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I

Origins of Study and Selection of Programs

Each year more than 22,000 candidates are awarded doctorates in engineering, the humanities, and the sciences from approximately 250 U.S. universities. They have spent, on the average, five and a half years in intensive education and research in preparation for careers either in universities or in settings outside the academic sector, and many will make significant contributions to research. Yet we are poorly informed concerning the quality of the programs producing these graduates. This study is intended to provide information pertinent to this complex and controversial subject.

The charge to the study committee directed it to build upon the planning that preceded it. The planning stages included a detailed review of the methodologies and the results of past studies that had focused on the assessment of doctoral-level programs. The committee has taken into consideration the reactions of various groups and individuals to those studies. The present assessment draws upon previous experience with program evaluation, with the aim of improving what was useful and avoiding some of the difficulties encountered in past studies. The present study, nevertheless, is not purely reactive: it has its own distinctive features. First, it focuses only on programs awarding research doctorates and their effectiveness in preparing students for careers in research. Although other purposes of graduate education are acknowledged to be important, they are outside the scope of this assessment. Second, the study examines a variety of different indices that may be relevant to the program quality. This multidimensional approach represents an explicit recognition of the limitations of studies that rely entirely on peer ratings of perceived quality--the so-called reputational ratings. Finally, in the compilation of reputational ratings in this study, evaluators were provided the names of faculty members involved with each program to be rated and the number of research doctorates awarded in the last five years. In previous reputational studies evaluators were not supplied such information.

During the past two decades increasing attention has been given to describing and measuring the quality of programs in graduate education. It is evident that the assessment of graduate programs is highly important for university administrators and faculty, for graduate students and prospective graduate students, for policymakers in state and national organizations, and for private and public funding agencies. Past experience, however, has demonstrated the difficulties with such assessments and their potentially controversial nature. As one critic has asserted:

> . . . the overall _effect_ of these reports seems quite clear. They tend, first, to make the rich richer and the poor poorer; second, the example of the highly ranked clearly imposes constraints on those institutions lower down the scale (the "Hertz-Avis" effect). And the effect of such constraints is to reduce diversity, to reward conformity or respectability, to penalize genuine experiment or risk. There is, also, I believe, an obvious tendency to promote the prevalence of disciplinary dogma and orthodoxy. All of this might be tolerable if the reports were tolerably accurate and judicious, if they were less _prescriptive_ and more _descriptive_; if they did not pretend to "objectivity" and if the very fact of ranking were not pernicious and invidious; if they genuinely promoted a meaningful "meritocracy"(instead of simply perpetuating the _status quo ante_ and an establishment mentality). But this is precisely what they cannot claim to be or do.[1]

The widespread criticisms of ratings in graduate education were carefully considered in the planning of this study. At the outset consideration was given to whether a national assessment of graduate programs should be undertaken at this time and, if so, what methods should be employed. The next two sections in this chapter examine the background and rationale for the decision by the Conference Board of Associated Research Councils[2] to embark on such a study. The remainder of the chapter describes the selection of disciplines and programs to be covered in the assessment.

The overall study encompasses a total of 2,699 graduate programs in 32 disciplines. In this report--the second of five reports issuing from the study--we examine 522 programs in nine disciplines in the humanities: art history, classics, English language and literature, French language and literature, German language and literature, linguistics, music, philosophy, and Spanish language and literature. These programs account for more than 90 percent of the research doctorates awarded in these nine disciplines. It should be emphasized that the selection of disciplines to be covered was determined primarily on the basis of total doctoral awards during the FY1976-78 period

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[1] William A. Arrowsmith, "Preface" in _The Ranking Game: The Power of the Academic Elite_, by W. Patrick Dolan, University of Nebraska Printing and Duplicating Service, Lincoln, Nebraska, 1976, p. ix.

[2] The Conference Board includes representatives of the American Council of Learned Societies, American Council on Education, National Research Council, and Social Science Research Council.

(as described later in this chapter), and the exclusion of a particular discipline was in no way based on a judgment of the importance of graduate education or research in that discipline. Also, although the assessment is limited to programs leading to the research-doctorate (Ph.D. or equivalent) degree, the Conference Board and study committee recognize that graduate schools provide many other forms of valuable and needed education.

PRIOR ATTEMPTS TO ASSESS QUALITY IN GRADUATE EDUCATION

Universities and affiliated organizations have taken the lead in the review of programs in graduate education. At most institutions program reviews are carried out on a regular basis and include a comprehensive examination of the curriculum and educational resources as well as the qualifications of faculty and students. One special form of evaluation is that associated with institutional accreditation:

> The process begins with the institutional or programmatic self-study, a comprehensive effort to measure progress according to previously accepted objectives. The self-study considers the interest of a broad cross-section of constituencies--students, faculty, administrators, alumni, trustees, and in some circumstances the local community. The resulting report is reviewed by the appropriate accrediting commission and serves as the basis for evaluation by a site-visit team from the accrediting group. . . . Public as well as educational needs must be served simultaneously in determining and fostering standards of quality and integrity in the institutions and such specialized programs as they offer. Accreditation, conducted through nongovernmental institutional and specialized agencies, provides a major means for meeting those needs.[3]

Although formal accreditation plays an important role in higher education, many university administrators do not view such procedures as an adequate means of assessing program quality. Other efforts are being made by universities to evaluate their programs in graduate education. The Educational Testing Service, with the sponsorship of the Council of Graduate Schools in the United States and the Graduate Record Examinations Board, has recently developed a set of procedures to assist institutions in evaluating their own graduate programs.[4]

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[3] Council on Postsecondary Accreditation, The Balance Wheel for Accreditation, Washington, D.C., July 1981, pp. 2-3.

[4] For a description of these procedures, see M. J. Clark, Graduate Program Self-Assessment Service: Handbook for Users, Educational Testing Service, Princeton, New Jersey, 1980.

While reviews at the institutional (or state) level have proven useful in assessing the relative strengths and weaknesses of individual programs, they have not provided the information required for making national comparisons of graduate programs. Several attempts have been made at such comparisons. The most widely used of these have been the studies by Keniston (1959), Cartter (1966), and Roose and Andersen (1970). All three studies covered a broad range of disciplines in engineering, the humanities, and the sciences and were based on the opinions of knowledgeable individuals in the program areas covered. Keniston[5] surveyed the department chairmen at 25 leading institutions. The Cartter[6] and Roose-Andersen[7] studies compiled ratings from much larger groups of faculty peers. The stated motivation for these studies was to increase knowledge concerning the quality of graduate education:

> A number of reasons can be advanced for undertaking such a study. The diversity of the American system of higher education has properly been regarded by both the professional educator and the layman as a great source of strength, since it permits flexibility and adaptability and encourages experimentation and competing solutions to common problems. Yet diversity also poses problems. . . . Diversity can be a costly luxury if it is accompanied by ignorance. . . . Just as consumer knowledge and honest advertising are requisite if a competitive economy is to work satisfactorily, so an improved knowledge of opportunities and of quality is desirable if a diverse educational system is to work effectively.[8]

Although the program ratings from the Cartter and Roose-Andersen studies are highly correlated, some substantial differences in successive ratings can be detected for a small number of programs--suggesting changes in the programs or in the perception of the programs. For the past decade the Roose-Andersen ratings have generally been regarded as the best available source of information on the quality of doctoral programs. Although the ratings are now more than 10 years out of date and have been criticized on a variety of grounds, they are still used extensively by individuals within the academic community and by those in federal and state agencies.

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[5] H. Keniston, Graduate Study in Research in the Arts and Sciences at the University of Pennsylvania, University of Pennsylvania Press, Phildelphia, 1959.

[6] A. M. Cartter, An Assessment of Quality in Graduate Education, American Council on Education, Washington, D.C., 1966.

[7] K. D. Roose and C. J. Andersen, A Rating of Graduate Programs, American Council on Education, Washington, D.C., 1970.

[8] Cartter, p. 3.

A frequently cited criticism of the Cartter and Roose-Andersen studies is their exclusive reliance upon reputational measurement.

> The ACE rankings are but a small part of all the evaluative processes, but they are also the most public, and they are clearly based on the narrow assumptions and elitist structures that so dominate the present direction of higher education in the United States. As long as our most prestigious source of information about postsecondary education is a vague popularity contest, the resultant ignorance will continue to provide a cover for the repetitious aping of a single model. . . . All the attempts to change higher education will ultimately be strangled by the "legitimate" evaluative processes that have already programmed a single set of responses from the start.[9]

A number of other criticisms have been leveled at reputational rankings of graduate programs.[10] First, such studies inherently reflect perceptions that may be several years out of date and do not take into account recent changes in a program. Second, the ratings of individual programs are likely to be influenced by the overall reputation of the university--i.e., an institutional "halo effect." Also, a disproportionately large fraction of the evaluators are graduates of and/or faculty members in the largest programs, which may bias the survey results. Finally, on the basis of such studies it may not be possible to differentiate among many of the lesser known programs in which relatively few faculty members have established national reputations in research.

Despite such criticisms several studies based on methodologies similar to those employed by Cartter and Roose and Andersen have been carried out during the past 10 years. Some of these studies evaluated post-baccalaureate programs in areas not covered in the two earlier reports--including business, religion, educational administration, and medicine. Others have focused exclusively on programs in particular disciplines within the sciences and humanities. A few attempts have been made to assess graduate programs in a broad range of disciplines, many of which were covered in the Roose-Andersen and Cartter ratings, but in the opinion of many each has serious deficiencies in the methods and procedures employed. In addition to such studies, a myriad of articles have been written on the assessment of graduate programs since the release of the Roose-Andersen report. With the heightening interest in these evaluations, many in the academic community have recognized the need to assess graduate programs, using other criteria in addition to peer judgment.

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[9] Dolan, p. 81.

[10] For a discussion of these criticisms, see David S. Webster, "Methods of Assessing Quality," Change, October 1981, pp. 20-24.

> Though carefully done and useful in a number of ways, these ratings (Cartter and Roose-Andersen) have been criticized for their failure to reflect the complexity of graduate programs, their tendency to emphasize the traditional values that are highly related to program size and wealth, and their lack of timeliness or currency. Rather than repeat such ratings, many members of the graduate community have voiced a preference for developing ways to assess the quality of graduate programs that would be more comprehensive, sensitive to the different program purposes, and appropriate for use at any time by individual departments or universities.[11]

Several attempts have been made to go beyond the reputational assessment. Clark, Harnett, and Baird, in a pilot study[12] of graduate programs in chemistry, history, and psychology, identified as many as 30 possible measures significant for assessing the quality of graduate education. Glower[13] has ranked engineering schools according to the total amount of research spending and the number of graduates listed in Who's Who in Engineering. House and Yeager[14] rated economics departments on the basis of the total number of pages published by full professors in 45 leading journals in this discipline. Other ratings based on faculty publication records have been compiled for graduate programs in a variety of disciplines, including political science, psychology, and sociology. These and other studies demonstrate the feasibility of a national assessment of graduate programs that is founded on more than reputational standing among faculty peers.

DEVELOPMENT OF STUDY PLANS

In September 1976 the Conference Board, with support from the Carnegie Corporation of New York and the Andrew W. Mellon Foundation, convened a three-day meeting to consider whether a study of programs in graduate education should be undertaken. The 40 invited participants in this meeting included academic administrators, faculty members, and agency and foundation officials,[15] and represented a variety of institutions, disciplines, and convictions. In these discussions there was considerable debate concerning whether the potential benefits of such a study outweighed the possible misrepresentations of the results. On the one hand, "a substantial majority of the Conference [participants believed] that the earlier assessments of graduate education have received wide and important use: by students and their advisors, by the institutions of higher education as aids to planning and the allocation of educational functions, as a check on unwarranted claims of excellence, and in social science research."[16] On the other hand, the Conference participants recognized that a new study assessing the quality of graduate education "would be conducted and received in a very different atmosphere than were the earlier Cartter and Roose-Andersen reports. . . . Where ratings were previously used in deciding where to increase funds and how to balance expanding programs, they might now be used in deciding where to cut off funds and programs."

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[11] Clark, p. 1.

[12] M. J. Clark, R. T. Harnett, and L. L. Baird, Assessing Dimensions of Quality in Doctoral Education: A Technical Report of a National Study in Three Fields, Educational Testing Service, Princeton, New Jersey, 1976.

[13] Donald D. Glower, "A Rational Method for Ranking Engineering Programs," Engineering Education, May 1980.

[14] Donald R. House and James H. Yeager, Jr., "The Distribution of Publication Success Within and Among Top Economics Departments: A Disaggregate View of Recent Evidence," Economic Inquiry, Vol. 16, No. 4, October 1978, pp. 593-598.

After an extended debate of these issues, it was the recommendation of this conference that a study with particular emphasis on the effectiveness of doctoral programs in educating research personnel be undertaken. The recommendation was based principally on four considerations:

(1) the importance of the study results to national and state bodies,
(2) the desire to stimulate continuing emphasis on quality in graduate education,
(3) the need for current evaluations that take into account the many changes that have occurred in programs since the Roose-Andersen study, and
(4) the value of extending the range of measures used in evaluative studies of graduate programs.

Although many participants expressed interest in an assessment of master's degree and professional degree programs, insurmountable problems prohibited the inclusion of these types of programs in this study.

Following this meeting a 13-member committee,[17] co-chaired by Gardner Lindzey and Harriet A. Zuckerman, was formed to develop a detailed plan for a study limited to research-doctorate programs and designed to improve upon the methodologies utilized in earlier studies. In its deliberations the planning committee carefully considered the criticisms of the Roose-Andersen study and other national assessments. Particular attention was paid to the feasibility of compiling a variety of specific measures (e.g., faculty publication records, quality of students, program resources) that were judged to be related to the quality of research-doctorate programs. Attention was also given to making improvements in the survey instrument and procedures used in the Cartter and Roose-Andersen studies. In September 1978 the planning group submitted a comprehensive report describing alternative strategies for an evaluation of the quality and effectiveness of research-doctorate programs.

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[15] See Appendix E for a list of the participants in this conference.
[16] From a summary of the Woods Hole Conference (see Appendix G).
[17] See Appendix H for a list of members of the planning committee.

> The proposed study has its own distinctive features. It is characterized by a sharp focus and a multidimensional approach. (1) It will focus only on programs awarding research doctorates; other purposes of doctoral training are acknowledged to be important, but they are outside the scope of the work contemplated. (2) The multidimensional approach represents an explicit recognition of the limitations of studies that make assessments solely in terms of ratings of perceived quality provided by peers--the so-called reputational ratings. Consequently, a variety of quality-related measures will be employed in the proposed study and will be incorporated in the presentation of the results of the study.[18]

This report formed the basis for the decision by the Conference Board to embark on a national assessment of doctorate-level programs in the sciences, engineering, and the humanities.

In June 1980 an 18-member committee was appointed to oversee the study. The committee,[19] made up of individuals from a diverse set of disciplines within the sciences, engineering, and the humanities, includes seven members who had been involved in the planning phase and several members who presently serve or have served as graduate deans in either public or private universities. During the first eight months the committee met three times to review plans for the study activities, make decisions on the selection of disciplines and programs to be covered, and design the survey instruments to be used. Early in the study an effort was made to solicit the views of presidents and graduate deans at more than 250 universities. Their suggestions were most helpful to the committee in drawing up final plans for the assessment. With the assistance of the Council of Graduate Schools in the United States, the committee and its staff have tried to keep the graduate deans informed about the progress being made in this study. The final section of this chapter describes the procedures followed in determining which research-doctorate programs were to be included in the assessment.

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[18] National Research Council, A Plan to Study the Quality and Effectiveness of Research-Doctorate Programs, 1978 (unpublished report).

[19] See p. iii of this volume for a list of members of the study committee.

SELECTION OF DISCIPLINES AND PROGRAMS TO BE EVALUATED

One of the most difficult decisions made by the study committee was the selection of disciplines to be covered in the assessment. Early in the planning stage it was recognized that some important areas of graduate education would have to be left out of the study. Limited financial resources required that efforts be concentrated on a total of no more than about 30 disciplines in the biological sciences, engineering, humanities, mathematical and physical sciences, and social sciences. At its initial meeting the committee decided that the selection of disciplines within each of these five areas should be made primarily on the basis of the total number of doctorates awarded nationally in recent years.

At the time the study was undertaken, aggregate counts of doctoral degrees earned during the FY1976-78 period were available from two independent sources--the Educational Testing Service (ETS) and the National Research Council (NRC). Table 1.1 presents doctoral awards data for 14 disciplines within the humanities. As alluded to in footnote 1 of the table, discrepancies between the ETS and NRC counts may be explained, in part, by differences in the data collection procedures. The ETS counts, derived from information provided by universities, have been categorized according to the discipline of the department/academic unit in which the degree was earned. The NRC counts were tabulated from the survey responses of FY1976-78 Ph.D. recipients, who had been asked to identify their fields of specialty. Initially the committee planned to include no more than five or six humanities disciplines in the assessment. However, because of the large number of disciplines within the humanities and because of the particular interests in this area on the part of a principal sponsor of the study, the committee decided to assess programs in as many as nine disciplines: art history, classics, English language and literature, French language and literature, German language and literature, linguistics, music, philosophy, and Spanish language and literature. In making this selection the committee took into account budgetary limitations that prohibited the inclusion of more than nine humanities disciplines and the importance of maintaining continuity with the earlier Roose-Andersen study. Since all nine of the humanities disciplines that were selected had been included in the earlier study as well,[20] it is possible to compare results from the two studies for a broad set of humanities programs. Although on the basis of numbers of recent doctoral awards four additional disciplines--comparative literature, dramatic and creative arts, religious studies, and speech/rhetoric/debate --might also have been selected, none of these four had been included in the earlier study.

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[20] The only humanities discipline included in the Roose-Andersen study but excluded in the committee's assessment is Russian language and literature, in which fewer than 200 doctoral degrees were awarded in the FY1976-78 period.

TABLE 1.1 Number of Research-Doctorates Awarded in Humanities Disciplines, FY1976-78

	Source of Data[1]	
	ETS	NRC
Disciplines Included in the Assessment		
English Language & Literature	3,192	3,301
Music	1,185	1,122
Philosophy	911	1,006
French Language & Literature	504	636
Spanish Language & Literature[2]	500	606
Linguistics	433	516
Art History	477	447
German Language & Literature	419	421
Classics	223	206
Disciplines Not Included in the Assessment		
Religious Studies[3]	704	540
Speech/Rhetoric/Debate[4]	650	228
Comparative Literature	517	422
Dramatic & Creative Arts	356	N/A
Russian Language & Literature	184	166
Other Humanities	N/A	608

[1] Data on FY1976-78 doctoral awards were derived from two independent sources: Educational Testing Service (ETS), Graduate Programs and Admissions Manual, 1979-81, and NRC's Survey of Earned Doctorates, 1976-78. Differences in field definitions account for discrepancies between the ETS and NRC data.

[2] Data from ETS include doctorates in Italian languages and literatures.

[3] Data from ETS include doctorates in theology as well as those in religion.

[4] Data from ETS may include doctorates awarded in hearing sciences; degrees in this field are not included in the NRC data.

The selection of research-doctorate programs to be evaluated in each discipline was made in two stages. Programs meeting any of the following criteria were initially nominated for inclusion in the study:

(1) more than a specified number (see below) of research doctorates awarded during the FY1976-78 period,
(2) more than one-third of that specified number of doctorates awarded in FY1979, or
(3) an average rating of 2.0 or higher in the Roose-Andersen rating of the scholarly quality of departmental faculty.

In each discipline the specified number of doctorates required for inclusion in the study was determined in such a way that the programs meeting this criterion accounted for at least 90 percent of the doctorates awarded in that discipline during the FY1976-78 period. In the humanities the following numbers of FY1976-78 doctoral awards were required to satisfy the first criterion (above):

Art History--5 or more doctorates
Classics--3 or more doctorates
English Language & Literature--13 or more doctorates
French Language & Literature--5 or more doctorates
German Language & Literature--4 or more doctorates
Linguistics--5 or more doctorates
Music--9 or more doctorates
Philosophy--6 or more doctorates
Spanish Language & Literature--5 or more doctorates

A list of the nominated programs at each institution was then sent to a designated individual (usually the graduate dean) who had been appointed by the university president to serve as study coordinator for the institution. The coordinator was asked to review the list and eliminate any programs no longer offering research doctorates or not belonging in the designated discipline. The coordinator also was given an opportunity to nominate additional programs that he or she believed should be included in the study.[21] Coordinators were asked to restrict their nominations to programs that they considered to be "of uncommon distinction" and that had awarded no fewer than two research doctorates during the past two years. In order to be eligible for inclusion, of course, programs had to belong in one of the disciplines covered in the study. If the university offered more than one research-doctorate program in a discipline, the coordinator was instructed to provide information on each of them so that these programs could be evaluated separately. As discussed in Chapter IX, particular problems were encountered in identifying research-doctorate programs in music, and the committee has serious reservations concerning the comparability of the 53 programs that were evaluated in this discipline.

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[21] See Appendix A for the specific instructions given to the coordinators.

The committee received excellent cooperation from the study coordinators at universities. Of the 243 institutions that were identified as having one or more research-doctorate programs satisfying the criteria (listed earlier) for inclusion in the study, only 7 declined to participate in the study and another 8 failed to provide the program information requested within the three-month period allotted (despite several reminders). None of these 15 institutions had doctoral programs that had received strong or distinguished reputational ratings in prior national studies. Since the information requested had not been provided, the committee decided not to include programs from these institutions in any aspect of the assessment. In each of the nine chapters that follows, a list is given of the universities that met the criteria for inclusion in a particular discipline but that are not represented in the study.

As a result of nominations by institutional coordinators, some programs were added to the original list and others dropped. Table 1.2 reports the final coverage in each of the nine humanities disciplines. The number of programs evaluated varies considerably by discipline. A total of 106 English programs have been included in the study; in linguistics and classics fewer than one-third this number have been in-

TABLE 1.2 Number of Programs Evaluated in Each Discipline and the Total FY1976-80 Doctoral Awards from These Programs

Discipline	Programs	FY1976-80 Doctorates*
Art History	41	752
Classics	35	334
English Language & Literature	106	4,687
French Language & Literature	58	811
German Language & Literature	48	616
Linguistics	35	652
Music	53	1,385
Philosophy	77	1,395
Spanish Language & Literature	69	812
Total	522	11,444

*The data on doctoral awards were provided by the study coordinator at each of the universities covered in the assessment.

cluded. Although the final determination of whether a program should be included in the assessment was left in the hands of the institutional coordinator, it is entirely possible that a few programs meeting the criteria for inclusion in the assessment were overlooked by the coordinators.

In the chapter that follows, a detailed description is given of each of the measures used in the evaluation of research-doctorate programs in the humanities. The description includes a discussion of the rationale for using the measure, the source from which data for that measure were derived, and any known limitations that would affect the interpretation of the data reported. The committee wishes to emphasize that there are limitations associated with each of the measures and that none of the measures should be regarded as a precise indicator of the quality of a program in educating humanists for careers in research. The reader is strongly urged to consider the descriptive material presented in Chapter II before attempting to interpret the program evaluations reported in subsequent chapters. In presenting a frank discussion of any shortcomings of each measure, the committee's intent is to reduce the possibility of misuse of the results from this assessment of research-doctorate programs.

II

Methodology

> Quality . . . you know what it is, yet you don't know what it is. But that's self-contradictory. But some things are better than others, that is, they have more quality. But when you try to say what the quality is, apart from the things that have it, it all goes poof! There's nothing to talk about. But if you can't say what Quality is, how do you know what it is, or how do you know that it even exists? If no one knows what it is, then for all practical purposes it doesn't exist at all. But for all practical purposes it really does exist. What else are the grades based on? Why else would people pay fortunes for some things and throw others in the trash pile? Obviously some things are better than others . . . but what's the "betterness"? . . . So round and round you go, spinning mental wheels and nowhere finding anyplace to get traction. What the hell is Quality? What is it?
>
> Robert M. Pirsig
> Zen and the Art of
> Motorcycle Maintenance

Both the planning committee and our own study committee have given careful consideration to the types of measures to be employed in the assessment of research-doctorate programs.[1] The committees recognized that any of the measures that might be used is open to criticism and that no single measure could be expected to provide an entirely satisfactory index of the quality of graduate education. With respect to the use of multiple criteria in educational assessment, one critic has commented:

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[1] A description of the measures considered may be found in the third chapter of the planning committee's report, along with a discussion of the relative merits of each measure.

> At best each is a partial measure encompassing a fraction of the large concept. On occasion its link to the real [world] is problematic and tenuous. Moreover, each measure [may contain] a load of irrelevant superfluities, "extra baggage" unrelated to the outcomes under study. By the use of a number of such measures, each contributing a different facet of information, we can limit the effect of irrelevancies and develop a more rounded and truer picture of program outcomes.[2]

Although the use of multiple measures alleviates the criticisms directed at a single dimension or measure, it certainly will not satisfy those who believe that the quality of graduate programs cannot be represented by quantitative estimates no matter how many dimensions they may be intended to represent. Furthermore, the usefulness of the assessment is dependent on the validity and reliability of the criteria on which programs are evaluated. The decision concerning which measures to adopt in the study was made primarily on the basis of two factors:

(1) the extent to which a measure was judged to be related to the quality of research-doctorate programs and
(2) the feasibility of compiling reliable data for making national comparisons of programs in particular disciplines.

Only measures that were applicable to a majority of the disciplines to be covered were considered. In reaching a final decision the study committee found the ETS study,[3] in which 27 separate variables were examined, especially helpful, even though it was recognized that many of the measures feasible in institutional self-studies would not be available in a national study. The committee was aided by the many suggestions received from university administrators and others within the academic community.

Although the initial design called for an assessment based on approximately six measures, the committee concluded that it would be highly desirable to expand this effort. A total of 12 measures (listed in Table 2.1) have been utilized in the assessment of research-doctorate programs in art history, classics, English language and literature, French language and literature, German language and literature, linguistics. music, philosophy, and Spanish language and literature. For seven of the measures data are available describing most, if not all,

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[2] C. H. Weiss, Evaluation Research: Methods of Assessing Program Effectiveness, Prentice-Hall, Inc., Englewood Cliffs, New Jersey, 1972, p. 56.

[3] See M. J. Clark et al. (1976) for a description of these variables.

R6000-14.2

This page is a duplicate of Table 2.1 and may be used as a guide to program measures by placing it beside the tables under examination.

MEASURES COMPILED ON INDIVIDUAL RESEARCH-DOCTORATE PROGRAMS IN THE HUMANITIES

Program Size[1] (See pages 18-19.)

01 Reported number of faculty members in the program, December 1980.

02 Reported number of program graduates in last five years (July 1975 through June 1980).

03 Reported total number of full-time and part-time graduate students enrolled in the program who intend to earn doctorates, December 1980.

Characteristics of Graduates[2] (See pages 19-22.)

04 Fraction of FY1975-79 program graduates who had received some national fellowship or training grant support during their graduate education.

05 Median number of years from first enrollment in graduate school to receipt of the doctorate--FY1975-79 program graduates.[3]

06 Fraction of FY1975-79 program graduates who at the time they completed requirements for the doctorate reported that they had made definite commitments for postgraduation employment.

07 Fraction of FY1975-79 program graduates who at the time they completed requirements for the doctorate reported that they had made definite commitments for postgraduation employment in Ph.D.-granting universities.

Reputational Survey Results[4] (See pages 22-27.)

08 Mean rating of the scholarly quality of program faculty (scale = 0 to 5).

09 Mean rating of the effectiveness of the program in educating research scholars/scientists (scale = 0 to 3).

10 Mean rating of the improvement in program quality in the last five years (scale = 0 to 2).

11 Mean rating of the evaluators' familiarity with the work of the program's faculty (scale = 0 to 2).

University Library Size[5] (See page 27.)

12 Composite index describing the library size in the university in which the program is located, 1979-80 (scale = -3 to +3).

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[1] Based on information provided to the committee by the participating universities.

[2] Based on data compiled in the NRC's Survey of Earned Doctorates.

[3] In reporting standardized scores and correlations with other variables, a shorter time-to-Ph.D. is assigned a higher score.

[4] Based on responses to the committee's survey conducted in April 1981.

[5] Based on data compiled by the Association of Research Libraries.

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TABLE 2.1 Measures Compiled on Individual Research-Doctorate Programs

Program Size[1]

01 Reported number of faculty members in the program, December 1980.

02 Reported number of program graduates in last five years (July 1975 through June 1980).

03 Reported total number of full-time and part-time graduate students enrolled in the program who intend to earn doctorates, December 1980.

Characteristics of Graduates[2]

04 Fraction of FY1975-79 program graduates who had received some national fellowship or training grant support during their graduate education.

05 Median number of years from first enrollment in graduate school to receipt of the doctorate--FY1975-79 program graduates.[3]

06 Fraction of FY1975-79 program graduates who at the time they completed requirements for the doctorate reported that they had made definite commitments for postgraduation employment.

07 Fraction of FY1975-79 program graduates who at the time they completed requirements for the doctorate reported that they had made definite commitments for postgraduation employment in Ph.D.-granting universities.

Reputational Survey Results[4]

08 Mean rating of the scholarly quality of program faculty.

09 Mean rating of the effectiveness of the program in educating research scholars/scientists.

10 Mean rating of the improvement in program quality in the last five years.

11 Mean rating of the evaluators' familiarity with the work of the program's faculty.

University Library Size[5]

12 Composite index describing the library size in the university in which the program is located, 1979-80.

[1] Based on information provided to the committee by the participating universities.

[2] Based on data compiled in the NRC's Survey of Earned Doctorates.

[3] In reporting standardized scores and correlations with other variables, a shorter time-to-Ph.D. is assigned a higher score.

[4] Based on responses to the committee's survey conducted in April 1981.

[5] Based on data compiled by the Association of Research Libraries.

of the humanities programs included in the assessment. For five measures the coverage is less complete but encompasses at least a majority of the programs in all but two disciplines. The actual number of programs evaluated on every measure is reported in the second table in each of the next nine chapters.

The 12 measures describe a variety of aspects important to the operation and function of research-doctorate programs--and thus are relevant to the quality and effectiveness of programs in educating humanists for careers in research. However, not all of the measures may be viewed as "global indices of quality." Some, such as those relating to program size, are best characterized as "program descriptors" that, although not dimensions of quality per se, are thought to have a significant influence on the effectiveness of programs. Other measures, such as those relating to university library size and support for graduate training, describe some of the resources generally recognized as being important in maintaining a vibrant program in graduate education. Measures derived from surveys of faculty peers, on the other hand, have traditionally been regarded as indices of the overall quality of graduate programs. Yet these too are not true measures of quality.

> We often settle for an easy-to-gather statistic, perfectly legitimate for its own limited purposes, and then forget that we haven't measured what we want to talk about. Consider, for instance, the reputation approach of ranking graduate departments: We ask a sample of physics professors (say) which the best physics departments are and then tabulate and report the results. The "best" departments are those that our respondents say are the best. Clearly it is useful to know which are the highly regarded departments in a given field, but prestige (which is what we are measuring here) isn't exactly the same as quality.[4]

To be sure, each of the 12 measures reported in this assessment has its own set of limitations. In the sections that follow an explanation is provided of how each measure has been derived and its particular limitations as a descriptor of research-doctorate programs.

PROGRAM SIZE

Information was collected from the study coordinators at each university on the names and ranks of program faculty, doctoral student enrollment, and number of Ph.D. graduates in each of the past five years (FY1976-80). Each coordinator was instructed to include on the faculty list those individuals who, as of December 1, 1980, held academic appointments (typically at the rank of assistant, associate, and full professor) and who participated significantly in doctoral education. Emeritus and adjunct members generally were not to be included. Measure 01 represents the number of faculty identified in a program. Measure 02 is the reported number of graduates who earned Ph.D. or equivalent research doctorates in a program during the period from July 1, 1975, through June 30, 1980. Measure 03 represents the total number of full-time and part-time students reported to be enrolled in a program in the fall of 1980, who intended to earn research doctorates. All three of these measures describe different aspects of program size. In previous studies program size has been shown to be highly correlated with the reputational ratings of a program, and this relationship is examined in detail in this report. It should be noted that since the information was provided by the institutions participating in the study, the data may be influenced by the subjective decisions made by the individuals completing the forms. For example, some institutional coordinators may be far less restrictive than others in deciding who should be included on the list of program faculty. To minimize variation in interpretation, detailed instructions were provided to those filling out the forms.[5] Measure 03 is of particular concern in this regard since the coordinators at some institutions may not have known how many of the students currently enrolled in graduate study intended to earn doctoral degrees.

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[4] John Shelton Reed, "How Not To Measure What a University Does," The Chronicle of Higher Education, Vol. 22, No. 12, May 11, 1981, p. 56.

CHARACTERISTICS OF GRADUATES

One of the most meaningful measures of the success of a research-doctorate program is the performance of its graduates. How many go on to lead productive careers in research and/or teaching? Unfortunately, reliable information on the subsequent employment and career achievements of the graduates of individual programs is not available. In the absence of this directly relevant information, the committee has relied on four indirect measures derived from data compiled in the NRC's Survey of Earned Doctorates.[6] Although each measure has serious limitations (described below), the committee believes it more desirable to include this information than not to include data about program graduates.

In identifying program graduates who had received their doctorates in the previous five years (FY1975-79),[7] the faculty lists furnished by the study coordinators at universities were compared with the names of dissertation advisers (available from the NRC survey). The latter source contains records for virtually all individuals who have earned research doctorates from U.S. universities since 1920. The institution, year, and specialty field of Ph.D. recipients were also used in determining the identity of program graduates. It is estimated that this matching process provided information on the graduate training and employment plans of more than 90 percent of the FY1975-79 graduates from the humanities programs. In the calculation of each of the four measures derived from the NRC survey, program data are reported only if the survey information is available on at least 10 graduates. Consequently, in the disciplines with smaller programs--art history and classics--only about half the programs are included in these measures, whereas more than 97 percent of the English programs are included.

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[5] A copy of the survey form and instructions sent to study coordinators is included in Appendix A.

[6] A copy of the questionnaire used in this survey is found in Appendix B.

[7] Survey data for the FY1980 Ph.D. recipients had not yet been compiled at the time this assessment was undertaken.

Measure 04 constitutes the fraction of FY1975-79 graduates of a program who had received at least some national fellowship support, including federal fellowships and traineeships, Woodrow Wilson fellowships, or fellowships/traineeships from other U.S. national organizations. One might expect the more selective programs to have a greater proportion of students with national fellowship support--especially "portable fellowships." Although the committee considered alternative measures of student ability (e.g., Graduate Record Examination scores, undergraduate grade point averages), reliable information of this sort was unavailable for a national assessment. It should be noted that the relevance of the fellowship measure varies considerably among disciplines. In the biomedical sciences a substantial fraction of the graduate students are supported by training grants and fellowships; in the humanities the majority are supported by teaching assistantships and their own resources.

Measure 05 is the median number of years elapsed from the time program graduates first enrolled in graduate school to the time they received their doctoral degrees. For purposes of analysis the committee has adopted the conventional wisdom that the most talented students are likely to earn their doctoral degrees in the shortest periods of time--hence, the shorter the median time-to-Ph.D., the higher the standardized score that is assigned. Although this measure has frequently been employed in social science research as a proxy for student ability, one must regard its use here with some skepticism. It is quite possible that the length of time it takes a student to complete requirements for a doctorate may be significantly affected by the explicit or implicit policies of a university or department. For example, in certain cases a short time-to-Ph.D. may be indicative of less stringent requirements for the degree. Furthermore, previous studies[8] have demonstrated that women and members of minority groups, for reasons having nothing to do with their abilities, are more likely than male Caucasians to interrupt their graduate education or to be enrolled on a part-time basis. As a consequence, the median time-to-Ph.D. may be longer for programs with larger fractions of women and minority students.

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[8] For a detailed analysis of this subject, see Dorothy M. Gilford and Joan Snyder, Women and Minority Ph.D.'s in the 1970's: A Data Book, National Academy of Sciences, Washington, D.C., 1977.

Measure 06 represents the fraction of FY1975-79 program graduates who reported at the time they had completed requirements for the doctorate that they had signed contracts or made firm commitments for postgraduation employment (including postdoctoral appointments as well as other positions in the academic or nonacademic sectors) and who provided the names of their prospective employers. Although this measure is likely to vary discipline by discipline according to the availability of employment opportunities, a program's standing relative to other programs in the same discipline should not be affected by this variation. In theory, the graduates with the greatest promise should have the easiest time in finding jobs. However, the measure is also influenced by a variety of other factors, such as personal job preferences and restrictions in geographic mobility, that are unrelated to the ability of the individual. It also should be noted parenthetically that unemployment rates for doctoral recipients are quite low and that nearly all of the graduates seeking jobs find positions soon after completing their doctoral programs.[9] Furthermore, first employment after graduation is by no means a measure of career achievement, which is what one would like to have if reliable data were available.

Measure 07, a variant of measure 06, constitutes the fraction of FY1975-79 program graduates who indicated that they had made firm commitments for employment in Ph.D.-granting universities and who provided the names of their prospective employers. This measure may be presumed to be an indication of the fraction of graduates likely to pursue careers in academic research, although there is no evidence concerning how many of them remain in academic research in the long term. In many humanities disciplines the path from Ph.D. to junior faculty has traditionally been regarded as the road of success for the growth and development of research talent. The committee is well aware, of course, that in recent years increasing numbers of graduates are entering the nonacademic sectors but has relied on a measure that reflects only the academic side. In the engineering and physical science disciplines, this limitation is of greater concern than it is in the humanities disciplines--in which only about 1 of every 10 graduates with definite employment plans intends to take a job outside the academic environs (see Table 2.2).

The inclusion of measures 06 and 07 in this assessment has been an issue much debated by members of the committee; the strenuous objections by three committee members regarding the use of these measures are expressed in the Minority Statement, which follows Chapter XII.

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[9] For new Ph.D. recipients in science and engineering, the unemployment rate has been less than 2 percent (see National Research Council, Postdoctoral Appointments and Disappointments, National Academy Press, Washington, D.C., 1981, p. 313).

TABLE 2.2 Percentage of FY1975-79 Doctoral Recipients with Definite Commitments for Employment Outside the Academic Sector*

Art History	13
Classics	10
English Language & Literature	11
French Language & Literature	13
German Language & Literature	13
Linguistics	18
Music	10
Philosophy	8
Spanish Language & Literature	7

*Percentages are based on respondents to the NRC's Survey of Earned Doctorates who indicated that they had made firm commitments for postgraduation employment and who provided the names of their prospective employers. These percentages may be considered to be lower-bound estimates of the actual percentages of doctoral recipients employed outside the academic sector.

REPUTATIONAL SURVEY RESULTS

In April 1981, survey forms were mailed to a total of 1,689 faculty members in art history, classics, English language and literature, French language and literature, German language and literature, linguistics, music, philosophy, and Spanish language and literature. The evaluators were selected from the faculty lists furnished by the study coordinators at the 228 universities covered in the assessment. These evaluators constituted approximately 20 percent of the total faculty population--8,593 faculty members--in the humanities programs being evaluated (see Table 2.3). The survey sample was chosen on the basis of the number of faculty in a particular program and the number of doctorates awarded in the previous five years (FY1976-80)--with the stipulation that at least one evaluator was selected from every program covered in the assessment. In selecting the sample each faculty rank was represented in proportion to the total number of individuals holding that rank, and preference was given to those faculty members whom the study coordinators had nominated to serve as evaluators. As shown in Table 2.3, 1,385 individuals, 82 percent of the survey sample in the humanities, had been recommended by study coordinators.[10]

Each evaluator was asked to consider a stratified random sample of

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[10] A detailed analysis of the survey participants in each discipline is given in subsequent chapters.

TABLE 2.3 Survey Response by Discipline and Characteristics of Evaluator

	Total Program Faculty	Survey Sample		
		Total	Respondents	
	N	N	N	%
Discipline of Evaluator				
Art History	520	150	94	63
Classics	373	150	100	67
English Language & Literature	3,280	318	198	62
French Language & Literature	613	174	110	63
German Language & Literature	445	150	95	63
Linguistics	501	150	105	70
Music	1,080	159	69	43
Philosophy	1,087	231	157	68
Spanish Language & Literature	694	207	136	66
Faculty Rank				
Professor	4,330	880	582	66
Associate Professor	2,611	522	337	61
Assistant Professor	1,480	240	139	58
Other	172	17	6	35
Evaluator Selection				
Nominated by Institution	2,797	1,385	905	65
Other	5,796	304	159	52
Survey Form				
With Faculty Names	N/A*	1,518	964	64
Without Names	N/A*	171	100	58
Total All Fields	8,593	1,689	1,064	63

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*Not applicable.

no more than 50 research-doctorate programs in his or her discipline--with programs stratified by the number of faculty members associated with each program. Every program was included on 150 survey forms. The set of programs to be evaluated appeared on each survey form in random sequence, preceded by an alphabetized list of all programs in that discipline that were being included in the study. No evaluator was asked to consider a program at his or her own institution. Ninety percent of the survey sample group were provided the names of faculty members in each of the programs to be evaluated, along with data on the total number of doctorates awarded in the last five years.[11] The inclusion of this information represents a significant departure from the procedures used in earlier reputational assessments. For purposes of comparison with previous studies, 10 percent (randomly selected in each discipline) were not furnished any information other than the names of the programs.

The survey items were adapted from the form used in the Roose-Andersen study. Prior to mailing, the instrument was pretested using a small sample of faculty members in chemistry and psychology. As a result, two significant improvements were made in the original survey design. A question was added on the extent to which the evaluator was familiar with the work of the faculty in each program. Responses to this question, reported as measure 11, provide some insight into the relationship between faculty recognition and the reputational standing of a program.[12] Also added was a question on the evaluator's field of specialization--thereby making it possible to compare program evaluations in different specialty areas within a particular discipline.

A total of 1,064 faculty members in the humanities--63 percent of those asked to participate--completed and returned survey forms (see Table 2.3). Two factors probably have contributed to this response rate being approximately 12 percentage points below the rates reported in the Cartter and Roose-Andersen studies.[13] First, because of the considerable expense of printing individualized survey forms (each 25-30 pages), second copies were not sent to sample members not responding to the first mailing[14]--as was done in the Cartter and Roose-Andersen efforts. Second, it is quite apparent that within the academic community there has been a growing dissatisfaction in recent years with educational assessments based on reputational measures. Indeed, this dissatisfaction was an important factor in the Conference

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[11] This information was furnished to the committee by the study coordinators at the universities participating in the study.

[12] Evidence of the strength of the relationship is provided by correlations presented in Chapters III-XI, and an analysis of the relationship is provided in Chapter XII.

[13] To compare the response rates obtained in the earlier surveys, see Roose and Andersen, Table 28, p. 29.

[14] A follow-up letter was sent to those not responding to the first mailing and a second copy was distributed to those few evaluators who specifically requested another form.

Board's decision to undertake a multidimensional assessment, and some faculty members included in the sample made known to the committee their strong objections to the reputational survey.

As can be seen in Table 2.3, there is some variation in the response rates in the nine humanities disciplines. Of particular interest is the relatively high rate of response from linguists and the low rate from those in music--the latter is undoubtedly related to the difficulties encountered in identifying research-doctorate programs in music and in compiling comparable lists of faculty members involved in these programs. It is not surprising to find that the evaluators nominated by study coordinators responded more often than did those who had been selected at random. Also, those furnished the lists of program faculty and numbers of recent graduates completed the survey more often than did evaluators who were given the abbreviated form. Only small differences were found among the response rates of assistant, associate, and full professors.

Each program was considered by an average of approximately 90 survey respondents from other programs in the same discipline. The evaluators were asked to judge programs in terms of scholarly quality of program faculty, effectiveness of the program in educating research scholars/scientists, and change in program quality in the last five years.[15] The mean ratings of a program on these three survey items constitute measures 08, 09, and 10. Evaluators were also asked to indicate the extent to which they were familiar with the work of the program faculty. The average of responses to this item constitutes measure 11.

In making judgments about the quality of faculty, evaluators were instructed to consider the scholarly competence and achievements of the individuals. The ratings were furnished on the following scale:

5 Distinguished
4 Strong
3 Good
2 Adequate
1 Marginal
0 Not sufficient for doctoral education
X Don't know well enough to evaluate

In assessing the effectiveness of a program, evaluators were asked to consider the accessibility of faculty, the curricula, the instructional and research facilities, the quality of the graduate students, the performance of graduates, and other factors that contribute to a program's effectiveness. This measure was rated accordingly:

3 Extremely effective
2 Reasonably effective

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[15] A copy of the survey instrument and accompanying instructions are included in Appendix C.

1 Minimally effective
0 Not effective
X Don't know well enough to evaluate

Evaluators were instructed to assess change in program quality on the basis of whether there has been improvement in the last five years in both the scholarly quality of faculty and the effectiveness in educating research scholars/scientists. The following alternatives were provided:

2 Better than five years ago
1 Little or no change in last five years
0 Poorer than five years ago
X Don't know well enough to evaluate

Evaluators were asked to indicate their familiarity with the work of the program faculty according to the following scale:

2 Considerable familiarity
1 Some familiarity
0 Little or no familiarity

In the computation of mean ratings on measures 08, 09, and 10, the "don't know" responses were ignored. An average program rating based on fewer than 15 responses (excluding "don't know") is not reported.

Measures 08, 09, and 10 are subject to many of the same criticisms that have been directed at previous reputational surveys. Although care has been taken to improve the sampling design and to provide evaluators with some essential information about each program, the survey results merely reflect a consensus of faculty opinions. As discussed in Chapter I, these opinions may well be based on out-of-date information or be influenced by a variety of factors unrelated to the quality of the program. In Chapter XII a number of factors that may possibly affect the survey results are examined. In addition to these limitations, it should be pointed out that evaluators, on the average, were unfamiliar with almost one-fifth of the programs they were asked to consider.[16] As might be expected, the smaller and less prestigious programs were not as well known, and for this reason one might have less confidence in the average ratings of these programs. For all four survey measures standard errors of the mean ratings are reported; they tend to be larger for the lesser known programs. The frequency of response to each of the survey items is discussed in Chapter XII.

One additional comment should be made regarding the survey activity. It should be emphasized that the ratings derived from the survey relect a program's standing relative to other programs in the same discipline and provide no basis for making cross-disciplinary comparisons. For example, the fact that a much larger number of English programs received "distinguished" ratings on measure 08 than did classics programs indicates nothing about the relative quality of faculty in these two disciplines. It may depend, in part, on the total numbers of programs evaluated in these disciplines; in the survey instructions it was suggested to evaluators that no more than 10 percent of the programs listed be designated as "distinguished." Nor is it advisable to compare the ratings of a program in one discipline with that of a program in another discipline because the ratings are based on the opinions of different groups of evaluators who were asked to judge entirely different sets of programs.

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[16] See Table 12.4 in Chapter XII.

UNIVERSITY LIBRARY SIZE

University library holdings are generally regarded as an important resource for students in graduate (and undergraduate) education. The Association of Research Libraries (ARL) has compiled data from its academic member institutions and developed a composite measure of a university library's size relative to those of other ARL members. The ARL Library Index, as it is called, is based on 10 characteristics: volumes held, volumes added (gross), microform units held, current serials received, expenditures for library materials, expenditures for binding, total salary and wage expenditures, other operating expenditures, number of professional staff, and number of nonprofessional staff.[17] The 1979-80 index, which constitutes measure 12, is available for 89 of the 228 universities included in the assessment (These 89 tend to be among the largest institutions.) The limited coverage of this measure is a major shortcoming. It should be noted that the ARL index is a composite description of library size and not a qualitative evaluation of the collections, services, or operations of the library. Also, it is a measure of aggregate size and does not take into account the library holdings in a particular department or discipline. Finally, although universities with more than one campus were instructed to include figures for the main campus only, some in fact may have reported library size for the entire university system. Whether this misreporting occurred is not known.

MEASURES OF RESEARCH SUPPORT AND PUBLICATION RECORDS

The committee's other four reports dealing with research-doctorate programs in the biological sciences, engineering, mathematical and physical sciences, and social sciences all present two additional measures pertaining to research support in individual programs and two measures pertaining to the publication records of program faculty and other staff. Comparable information for humanities programs are either unavailable or, in the committee's judgment, not relevant to an assessment of humanities programs, and consequently such information is not presented in this report. For example, data on the fraction of program faculty holding research grants from the National Science Foundation, National Institutes of Health, and Alcohol, Drug Abuse, and Mental Health Administration would not be meaningful in the humanities disciplines since very few faculty members receive support from any of these three sources (it was not feasible to compile information on research grant awards by other federal agencies). Data compiled by the National Science Foundation on total university expenditures for research and development in particular disciplines are not collected for any of the nine humanities disciplines. Finally, although counts could have been obtained on the numbers of recent articles authored by program faculty members in the humanities, the committee believes that such information would be misleading since it would not include the books or chapters of books authored by these faculty members. In the humanities disciplines books represent a major part of the publication effort, but reliable information on the authorship of books is not readily available.

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[17] See Appendix D for a description of the calculation of this index.

ANALYSIS AND PRESENTATION OF THE DATA

The next nine chapters present all of the information that has been compiled on individual research-doctorate programs in art history, classics, English language and literature, French language and literature, German language and literature, linguistics, music, philosophy, and Spanish language and literature. Each chapter follows a similar format, designed to assist the reader in the interpretation of program data. The first table in a chapter provides a list of the programs evaluated in a discipline--including the names of the universities and departments or academic units in which programs reside--along with the full set of data compiled for individual programs. Programs are listed alphabetically according to name of institution, and both raw and standardized values are given for all measures. For the reader's convenience an insert of information from Table 2.1 is provided which identifies each of the 12 measures reported in the table and indicates the raw scale used in reporting values for a particular measure. Standardized values, converted from raw values to have a mean of 50 and a standard deviation of 10,[18] are computed for every measure so that comparisons can easily be made of a program's relative standing on different measures. Thus, a standardized value of 30 corresponds with a raw value that is two standard deviations below the mean for that measure, and a standardized value of 70 represents a raw value two standard deviations above the mean. While the reporting of values in standardized form is convenient for comparing a particular program's standing on different measures, it may be misleading in interpreting actual differences in the values reported for two or more programs--especially when the distribution of the measure being examined is highly skewed. For example, the numbers of FY1976-80 program graduates (measure 02) from four English programs are reported in Table 5.1 as follows:

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[18] The conversion was made from the precise raw value rather than from the rounded value reported for each program. Thus, two programs may have the same reported raw value for a particular measure but different standardized values.

Program	Raw Value	Standardized Value
A	7	38
B	11	39
C	20	42
D	30	45

Although programs C and D have many times the number of graduates as have programs A and B, the differences reported on a standardized scale appear to be small. Thus, the reader is urged to take note of the raw values before attempting to interpret differences in the standardized values given for two or more programs.

The initial table in each chapter also presents estimated standard errors of mean ratings derived from the four survey items (measures 08-11). A standard error is an estimated standard deviation of the sample mean rating and may be used to assess the stability of a mean rating reported for a particular program.[19] For example, one may assert (with .95 confidence) that the population mean rating would lie within two standard errors of the sample mean rating reported in this assessment.

No attempt has been made to establish a composite ranking of programs in a discipline. Indeed, the committee is convinced that no single measure adequately reflects the quality of a research-doctorate program and wishes to emphasize the importance of viewing individual programs from the perspective of multiple indices or dimensions.

The second table in each chapter presents summary statistics (i.e., number of programs evaluated, mean, standard deviation, and decile values) for each of the program measures.[20] The reader should find these statistics helpful in interpreting the data reported on individual programs. Next is a table of the intercorrelations among the various measures for that discipline. This table should be of particular interest to those desiring information about the interrelations of the various measures.

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[19] The standard error estimate has been computed by dividing the standard deviation of a program's ratings by the square root of the number of ratings. For a more extensive discussion of this topic the reader may want to refer to Fred N. Kerlinger, Foundations of Behavioral Research, Holt, Reinhart, and Winston, Inc., New York, 1973, Chapter 12. Readers should note that the estimate is a measure of the variation in response and by no means includes all possible sources of error.

[20] Standardized scores have been computed from precise values of the mean and standard deviation of each measure and not the rounded values reported in the second table of a chapter.

The remainder of each chapter is devoted to an examination of results from the reputational survey. Included are an analysis of the characteristics of survey participants and graphical portrayals of the relationship of mean rating of scholarly quality of faculty (measure 08) with the number of faculty (measure 01) and the relationship of mean rating of program effectiveness (measure 09) with the number of graduates (measure 02). A frequently mentioned criticism of the Roose-Andersen and Cartter studies is that small but distinguished programs have been penalized in the reputational ratings because they are not as highly visible as larger programs of comparable quality. The comparisons of survey ratings with measures of program size are presented as the first two figures in each chapter, and provide evidence about the number of small programs in each discipline that have received high reputational ratings. Since in each case the reputational rating is more highly correlated with the square root of program size than with the size measure itself, measures 01 and 02 are plotted on a square root scale.[21] To assist the reader in interpreting results of the survey evaluations, each chapter concludes with a graphical presentation of the mean rating for every program of the scholarly quality of faculty (measure 08) and an associated "confidence interval" of 1.5 standard errors. In comparing the mean ratings of two programs, if their reported confidence intervals of 1.5 standard errors do not overlap, one may safely conclude that the program ratings are significantly different (at the .05 level of significance)--i.e., the observed difference in mean ratings is too large to be plausibly attributable to sampling error.[22]

The final chapter of this report gives an overview of the evaluation process in the nine humanities disciplines and includes a summary of general findings. Particular attention is given to some of the extraneous factors that may influence program ratings of individual evaluators and thereby distort the survey results. The chapter concludes with a number of specific suggestions for improving future assessments of research-doctorate programs.

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[21] For a general discussion of transforming variables to achieve linear fits, see John W. Tukey, Exploring Data Analysis, Addison-Wesley, Reading, Massachusetts, 1977.

[22] This rule for comparing nonoverlapping intervals is valid as long as the ratio of the two estimated standard errors does not exceed 2.41. (The exact statistical significance of this criterion then lies between .050 and .034.) Inspection of the standard errors reported in each discipline shows that for programs with mean ratings differing by less than 1.0 (on measure 08), the standard error of one mean very rarely exceeds twice the standard error of another.

III

Art History Programs

In this chapter 41 research-doctorate programs in art history are assessed. These programs, according to the information supplied by their universities, have accounted for 752 doctoral degrees awarded during the FY1976-80 period.[1] On the average, 33 full-time and part-time students intending to earn doctorates were enrolled in a program in December 1980, with an average faculty size of 13 members.[2] Most of the 41 programs, listed in Table 3.1, are located in art history or art history and archaeology departments. Approximately one-third are found in departments of fine arts or art. As many as 9 of the programs were initiated since 1970, and no two programs are located in the same university. In addition to the 41 institutions represented in this discipline, another 4 were initially identified as meeting the criteria[3] for inclusion in the assessment:

Illinois State University--Normal
North Texas State University
Texas Tech University--Lubbock
Union for Experimenting Colleges
  and Universities

The last institution chose not to participate in the assessment in any discipline. Art history programs at the other three institutions have not been included in the evaluations in this discipline, since in each case the study coordinator either indicated that the institution did not at that time have a research-doctorate program in art history or failed to provide the information requested by the committee.

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[1] Data from the NRC's Survey of Earned Doctorates indicate that 758 research doctorates in history and criticism of art were awarded by U.S. universities between FY1976 and FY1980. Since the NRC figure is based on field of degree and not department, it may exclude some doctorates included in the numbers reported by the institutional coordinators.

[2] See the reported means for measures 03 and 01 in Table 3.2.

[3] As mentioned in Chapter I, the primary criterion for inclusion was that a university had awarded at least 5 doctorates in art history during the FY1976-78 period.

Before examining individual program results presented in Table 3.1, the reader is urged to refer to Chapter II, in which each of the 12 measures used in the assessment is discussed. Summary statistics describing every measure are given in Table 3.2. For eight of the measures, data are reported for at least 38 of the 41 art history programs. For measures 04-07, which pertain to characteristics of the program graduates, data are presented for only approximately half of the programs; the other half had too few graduates on which to base statistics.[4]

Intercorrelations among the 12 measures (Pearson product-moment coefficients) are given in Table 3.3. Of particular note are the high positive correlations of the measures of faculty size (01) and the number of recent graduates (02) with reputational survey ratings (08, 09). Figure 3.1 illustrates the relation between the mean rating of the scholarly quality of faculty (measure 08) and the number of faculty members (measure 01) for each of 41 programs in art history. Figure 3.2 plots the mean rating of program effectiveness (measure 09) against the total number of FY1976-80 program graduates (measure 02). Although in both figures there is a significant positive correlation between program size and reputational rating, it is quite apparent that some of the smaller programs received high mean ratings and that some of the larger programs received low mean ratings.

Table 3.4 describes the 94 faculty members who participated in the evaluation of art history programs. These individuals constituted 63 percent of those asked to respond to the survey in this discipline and 18 percent of the faculty population in the 41 research-doctorate programs being evaluated.[5] Almost half of the survey participants had earned their highest degree since 1970, and a majority held the rank of full professor.

Two exceptions should be noted with regard to the survey evaluations in this discipline. It has been called to the attention of the committee that the faculty list (used in the survey) for the Department of Art at Florida State University was missing the names of 11 members and that the faculty list for the Department of History of Art at Johns Hopkins University was missing the names of 2 members. The committee has decided to report the survey results for these two programs, but with the caution that the reputational ratings may have been influenced by the omission of these names.

To assist the reader in interpreting results of the survey evaluations, estimated standard errors have been computed for mean ratings of the scholarly quality of the faculty in 41 art history programs (and are given in Table 3.1). For each program the mean rating and an associated "confidence interval" of 1.5 standard errors are illustrated in Figure 3.3 (listed in order of highest to lowest mean rating). In comparing two programs, if their confidence intervals do not overlap, one may conclude that there is a significant difference in their mean ratings at a .05 level of significance.[6] From this figure it is also apparent that one should have somewhat more confidence in the accuracy of the mean ratings of higher-rated programs than lower-rated programs. This generalization results primarily from the fact that evaluators are not as likely to be familiar with the less prestigious programs, and consequently the mean ratings of these programs are usually based on fewer survey responses.

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[4] As mentioned in Chapter II, data for measures 04-07 are not reported if they are based on the survey responses of fewer than 10 FY1975-79 program graduates.

[5] See Table 2.3 in Chapter II.

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[6] See pp. 28-30 for a discussion of the interpretation of mean ratings and associated confidence intervals.

TABLE 3.1 Program Measures (Raw and Standardized Values) in Art History

Prog No.	University - Department/Academic Unit	Program Size			Characteristics of Program Graduates			
		(01)	(C2)	(03)	(04)	(05)	(06)	(07)
001.	Boston University	15	9	32	.00	NA	.40	.20
	Art History	*54*	*45*	*50*	*28*		*24*	*31*
002.	Brown University	8	13	40	NA	NA	NA	NA
	Art	*41*	*47*	*52*				
003.	Bryn Mawr College	8	15	31	.36	9.0	.46	.27
	History of Art	*41*	*48*	*49*	*53*	*53*	*29*	*40*
004.	California, University of-Berkeley	14	33	38	.32	9.5	.63	.33
	Art and History of Art	*52*	*58*	*51*	*51*	*48*	*46*	*48*
005.	California, University of-Los Angeles	14	32	18	.21	9.5	.62	.35
	Art	*52*	*57*	*46*	*43*	*48*	*45*	*50*
006.	Case Western Reserve University	13	5	9	NA	NA	NA	NA
	Art	*51*	*43*	*44*				
007.	Chicago, University of	10	18	53	.41	9.5	.65	.41
	Art	*45*	*50*	*55*	*57*	*48*	*48*	*58*
008.	Columbia University	27	75	268	.23	10.0	.65	.39
	Art History and Archaeology	*76*	*80*	*99*	*44*	*44*	*48*	*55*
009.	Cornell University-Ithaca	14	6	11	NA	NA	NA	NA
	History of Art and Archaeology	*52*	*44*	*45*				
010.	Delaware, University of-Newark	9	12	24	NA	NA	NA	NA
	Art History	*43*	*47*	*48*				
011.	Florida State University-Tallahassee	15	7	10	NA	NA	NA	NA
	*Art**	*54*	*44*	*45*				
012.	Georgia, University of-Athens	7	7	8	NA	NA	NA	NA
	Art	*40*	*44*	*44*				
013.	Harvard University	18	61	98	.40	8.8	.70	.35
	Fine Arts	*60*	*72*	*65*	*56*	*55*	*53*	*51*
014.	Indiana University-Bloomington	12	23	40	.21	10.3	.84	.42
	Fine Arts	*49*	*52*	*52*	*43*	*42*	*66*	*60*
015.	Iowa, University of-Iowa City	10	5	41	NA	NA	NA	NA
	Art and Art History	*45*	*43*	*52*				
016.	Johns Hopkins University	7	21	10	.39	8.0	.80	.53
	History of Art	*40*	*51*	*45*	*55*	*62*	*62*	*74*
017.	Kansas, University of	14	7	34	NA	NA	NA	NA
	Art History	*52*	*44*	*50*				
018.	Maryland, University of-College Park	15	6	22	NA	NA	NA	NA
	Art	*54*	*44*	*47*				
019.	Michigan, University of-Ann Arbor	20	43	22	.29	10.9	.65	.27
	History of Art	*64*	*63*	*47*	*48*	*36*	*48*	*40*
020.	Minnesota, University of	13	11	18	NA	NA	NA	NA
	Art History	*51*	*46*	*46*				

* indicates program was initiated since 1970.

NOTE: On the first line of data for every program, raw values for each measure are reported; on the second line values are reported in standardized form, with mean = 50 and standard deviation = 10. "NA" indicates that the value for a measure is not available.

TABLE 3.1 Program Measures (Raw and Standardized Values) in Art History

Prog	Survey Results				University Library	Survey Ratings Standard Error			
No.	(08)	(09)	(10)	(11)	(12)	(08)	(09)	(10)	(11)
001.	2.6	1.4	1.4	1.2	-0.4	.10	.08	.10	.07
	49	*48*	*64*	*52*	*40*				
002.	3.1	1.9	1.2	1.3	-1.1	.09	.05	.07	.07
	54	*55*	*55*	*54*	*33*				
003.	3.5	2.3	0.6	1.5	NA	.09	.06	.07	.07
	57	*61*	*24*	*59*					
004.	4.3	2.3	1.0	1.7	2.2	.07	.06	.09	.06
	64	*61*	*47*	*64*	*65*				
005.	3.2	1.7	1.3	1.3	2.0	.09	.07	.08	.06
	54	*53*	*58*	*56*	*63*				
006.	1.5	0.8	0.9	0.7	-1.3	.12	.08	.10	.07
	40	*39*	*39*	*41*	*30*				
007.	3.0	1.8	0.8	1.3	0.9	.08	.05	.08	.07
	53	*54*	*37*	*54*	*52*				
008.	4.7	2.5	1.0	1.8	1.7	.06	.06	.07	.05
	68	*66*	*43*	*66*	*61*				
009.	2.9	1.8	1.0	1.0	1.6	.09	.08	.11	.07
	52	*53*	*45*	*48*	*59*				
010.	2.7	1.8	1.5	1.1	NA	.10	.07	.08	.07
	50	*53*	*67*	*51*					
011.	1.2	0.7	1.1	0.8	-0.4	.14	.09	.12	.07
	37	*37*	*50*	*43*	*39*				
012.	1.4	0.7	1.3	0.5	0.4	.13	.10	.13	.06
	39	*37*	*59*	*37*	*48*				
013.	4.9	2.7	0.9	1.9	3.0	.04	.05	.08	.03
	69	*68*	*41*	*68*	*73*				
014.	2.9	1.6	1.2	1.2	0.9	.09	.07	.08	.07
	52	*51*	*53*	*53*	*53*				
015.	2.3	1.2	1.1	1.0	0.3	.11	.09	.05	.07
	47	*45*	*51*	*49*	*46*				
016.	3.5	2.0	1.6	1.5	-0.4	.08	.06	.08	.07
	58	*57*	*73*	*59*	*39*				
017.	2.1	1.4	1.1	0.8	0.1	.12	.09	.08	.07
	45	*48*	*50*	*43*	*44*				
018.	2.6	1.4	1.2	1.1	0.2	.10	.07	.08	.07
	49	*48*	*52*	*49*	*45*				
019.	3.6	2.2	1.1	1.5	1.8	.09	.06	.06	.06
	58	*60*	*48*	*59*	*61*				
020.	2.3	1.4	1.0	0.9	1.2	.11	.09	.08	.08
	47	*47*	*47*	*45*	*55*				

NOTE: On the first line of data for every program, raw values for each measure are reported; on the second line values are reported in standardized form, with mean = 50 and standard deviation = 10. "NA" indicates that the value for a measure is not available.

TABLE 3.1 Program Measures (Raw and Standardized Values) in Art History

Prog No.	University - Department/Academic Unit	Program Size			Characteristics of Program Graduates			
		(01)	(02)	(03)	(04)	(05)	(06)	(07)
021.	Missouri, University of-Columbia	6	5	12	NA	NA	NA	NA
	*Art History and Archaeology**	*38*	*43*	*45*				
022.	New Mexico, University of-Albuquerque	10	7	NA	NA	NA	NA	NA
	*Art**	*45*	*44*					
023.	New York University	26	84	71	.21	10.6	.78	.33
	Fine Arts	*75*	*84*	*59*	*43*	*39*	*60*	*47*
024.	North Carolina, University of-Chapel Hill	14	18	17	.67	8.5	.59	.32
	Art	*52*	*50*	*46*	*74*	*57*	*42*	*46*
025.	Northwestern University	8	10	9	.30	10.0	.70	.20
	*Art History**	*41*	*46*	*44*	*49*	*44*	*53*	*31*
026.	Ohio State University-Columbus	14	7	37	NA	NA	NA	NA
	*History of Art**	*52*	*44*	*51*				
027.	Ohio University-Athens	3	22	21	.12	12.3	.75	.38
	Comparative Arts	*32*	*52*	*47*	*36*	*24*	*57*	*54*
028.	Oregon, University of-Eugene	8	3	5	NA	NA	NA	NA
	Art History	*41*	*42*	*43*				
029.	Pennsylvania State University	8	11	12	NA	9.5	NA	NA
	Art History	*41*	*46*	*45*		*48*		
030.	Pennsylvania, University of	11	23	26	.44	8.4	.73	.32
	History of Art	*47*	*52*	*48*	*58*	*58*	*55*	*46*
031.	Pittsburgh, University of	10	12	19	.54	7.3	.62	.39
	Fine Arts	*45*	*47*	*47*	*65*	*68*	*45*	*55*
032.	Princeton University	20	34	35	.28	9.3	.71	.31
	Art and Archaeology	*64*	*58*	*50*	*47*	*50*	*54*	*46*
033.	Rutgers, The State University-New Brunswick	12	3	79	NA	NA	NA	NA
	*Art History**	*49*	*42*	*61*				
034.	Southern California, University of	5	2	11	NA	NA	NA	NA
	*Fine Arts**	*36*	*41*	*45*				
035.	Stanford University	17	14	23	.18	8.7	.69	.38
	Art	*58*	*48*	*48*	*40*	*56*	*52*	*54*
036.	Texas, University of-Austin	16	2	17	NA	NA	NA	NA
	*Art**	*56*	*41*	*46*				
037.	Virginia, University of	11	10	17	NA	NA	NA	NA
	Art	*47*	*46*	*46*				
038.	Washington University-Saint Louis	10	5	5	NA	NA	NA	NA
	Art and Archaeology	*45*	*43*	*43*				
039.	Washington, University of-Seattle	14	9	2	NA	NA	NA	NA
	Art History	*52*	*45*	*43*				
040.	Wisconsin, University of-Madison	8	13	26	.40	9.0	.69	.39
	Art History	*41*	*47*	*48*	*56*	*53*	*52*	*55*

* indicates program was initiated since 1970.

NOTE: On the first line of data for every program, raw values for each measure are reported; on the second line values are reported in standardized form, with mean = 50 and standard deviation = 10. "NA" indicates that the value for a measure is not available.

TABLE 3.1 Program Measures (Raw and Standardized Values) in Art History

Prog No.	Survey Results (08)	Survey Results (09)	Survey Results (10)	Survey Results (11)	University Library (12)	Survey Ratings Standard Error (08)	Survey Ratings Standard Error (09)	Survey Ratings Standard Error (10)	Survey Ratings Standard Error (11)
021.	1.3	0.7	0.7	0.6	-0.2	.16	.11	.13	.07
	38	*37*	*28*	*38*	*41*				
022.	1.4	0.9	1.1	0.5	-1.0	.13	.11	.11	.07
	39	*40*	*48*	*37*	*33*				
023.	4.9	2.7	1.1	1.9	0.5	.04	.05	.08	.03
	70	*69*	*51*	*69*	*48*				
024.	3.0	1.8	1.5	1.2	1.0	.08	.07	.07	.07
	53	*53*	*68*	*53*	*53*				
025.	2.5	1.4	1.3	1.2	0.3	.10	.09	.09	.08
	48	*48*	*60*	*52*	*46*				
026.	1.8	1.0	1.1	0.8	0.9	.11	.09	.07	.07
	42	*42*	*50*	*43*	*52*				
027.	0.3	0.3	NA	0.2	NA	.10	.09	NA	.05
	29	*31*		*30*					
028.	1.4	0.8	1.3	0.5	-0.9	.14	.11	.10	.07
	39	*39*	*60*	*37*	*34*				
029.	2.4	1.4	0.9	1.0	0.7	.11	.07	.06	.07
	47	*47*	*41*	*47*	*50*				
030.	3.5	2.0	1.3	1.4	0.7	.08	.05	.08	.06
	57	*58*	*58*	*58*	*50*				
031.	3.0	1.6	1.1	1.1	0.1	.09	.07	.10	.08
	53	*52*	*48*	*50*	*44*				
032.	4.5	2.5	1.2	1.8	0.9	.06	.06	.08	.05
	66	*65*	*53*	*66*	*52*				
033.	2.4	1.4	1.3	1.0	0.8	.09	.08	.08	.07
	48	*48*	*59*	*49*	*51*				
034.	0.5	0.3	1.0	0.4	0.4	.10	.07	.14	.06
	31	*31*	*45*	*34*	*47*				
035.	3.7	2.1	1.1	1.4	2.0	.07	.05	.05	.07
	59	*60*	*48*	*57*	*63*				
036.	2.1	1.1	1.3	0.8	1.6	.11	.11	.10	.07
	45	*44*	*58*	*44*	*59*				
037.	2.6	1.5	1.2	1.2	0.7	.09	.07	.11	.06
	50	*50*	*53*	*52*	*51*				
038.	2.1	1.1	0.9	0.7	-0.4	.11	.10	.07	.07
	45	*43*	*38*	*42*	*39*				
039.	1.6	0.9	1.0	0.5	1.5	.13	.11	.14	.07
	40	*40*	*45*	*35*	*58*				
040.	1.7	1.2	0.9	0.7	1.6	.12	.09	.08	.07
	41	*45*	*39*	*42*	*59*				

NOTE: On the first line of data for every program, raw values for each measure are reported; on the second line values are reported in standardized form, with mean = 50 and standard deviation = 10. "NA" indicates that the value for a measure is not available.

TABLE 3.1 Program Measures (Raw and Standardized Values) in Art History

Prog No.	University - Department/Academic Unit	Program Size			Characteristics of Program Graduates			
		(01)	(02)	(03)	(04)	(05)	(06)	(07)
041.	Yale University	26	49	68	.35	7.7	.78	.43
	History of Art	*75*	*66*	*58*	*53*	*65*	*60*	*61*

* indicates program was initiated since 1970.

NOTE: On the first line of data for every program, raw values for each measure are reported; on the second line values are reported in standardized form, with mean = 50 and standard deviation = 10. "NA" indicates that the value for a measure is not available.

TABLE 3.1 Program Measures (Raw and Standardized Values) in Art History

Prog No.	Survey Results (08)	(09)	(10)	(11)	University Library (12)	Survey Ratings Standard Error (08)	(09)	(10)	(11)
041.	4.7	2.7	1.1	1.8	2.1	.05	.05	.08	.04
	68	*68*	*48*	*67*	*64*				

NOTE: On the first line of data for every program, raw values for each measure are reported; on the second line values are reported in standardized form, with mean = 50 and standard deviation = 10. "NA" indicates that the value for a measure is not available.

TABLE 3.2 Summary Statistics Describing Each Program Measure--Art History

Measure	Number of Programs Evaluated	Mean	Standard Deviation	DECILES								
				1	2	3	4	5	6	7	8	9
Program Size												
01 Raw Value	41	13	5	7	8	9	10	12	14	14	15	20
Std Value	41	50	10	40	41	43	45	49	52	52	54	64
02 Raw Value	41	18	19	3	5	7	9	11	13	18	23	42
Std Value	41	50	10	42	43	44	45	46	47	50	52	62
03 Raw Value	40	33	43	8	10	12	18	22	26	34	40	68
Std Value	40	50	10	44	45	45	46	47	48	50	52	58
Program Graduates												
04 Raw Value	20	.32	.14	.12	.21	.21	.28	.30	.35	.39	.40	.44
Std Value	20	50	10	36	42	42	47	49	52	55	56	59
05 Raw Value	20	9.3	1.1	10.9	10.3	10.0	9.5	9.5	9.0	8.8	8.5	8.0
Std Value	20	50	10	36	41	44	48	48	53	55	57	62
06 Raw Value	20	.67	.10	.46	.62	.63	.65	.69	.70	.71	.75	.78
Std Value	20	50	10	29	45	46	48	52	53	54	58	61
07 Raw Value	20	.35	.08	.20	.27	.32	.33	.35	.38	.39	.39	.42
Std Value	20	50	10	31	40	46	48	50	54	55	55	59
Survey Results												
08 Raw Value	41	2.7	1.1	1.3	1.6	2.1	2.3	2.6	2.9	3.1	3.5	4.5
Std Value	41	50	10	38	41	45	47	49	52	54	57	66
09 Raw Value	41	1.5	.6	.7	.9	1.2	1.4	1.4	1.7	1.8	2.1	2.5
Std Value	41	50	10	37	40	45	48	48	53	54	59	65
10 Raw Value	40	1.1	.2	.9	.9	1.0	1.1	1.1	1.1	1.2	1.3	1.3
Std Value	40	50	10	40	40	45	50	50	50	55	60	60
11 Raw Value	41	1.1	.4	.5	.7	.8	1.0	1.1	1.2	1.3	1.5	1.8
Std Value	41	50	10	36	41	43	48	50	53	55	60	67
University Library												
12 Raw Value	38	.7	1.0	-1.0	-.4	.1	.4	.7	.9	1.1	1.6	2.0
Std Value	38	50	10	33	39	44	47	50	52	54	59	63

NOTE: Standardized values reported in the preceding table have been computed from exact values of the mean and standard deviation and not the rounded values reported here.

TABLE 3.3 Intercorrelations Among Program Measures on 41 Programs in Art History

	Measure											
	01	02	03	04	05	06	07	08	09	10	11	12
Program Size												
01		.72	.58	-.16	.05	.10	-.04	.69	.67	.00	.66	.49
02			.68	-.14	-.22	.33	.13	.76	.74	-.06	.75	.49
03				-.13	-.10	.04	.16	.52	.50	-.13	.50	.34
Program Graduates												
04					.68	.05	.23	.12	.17	-.03	.10	.02
05						-.16	.31	.36	.36	.14	.32	-.11
06							.60	.10	.09	.19	.08	.13
07								.08	.07	.02	.00	.09
Survey Results												
08									.99	.05	.98	.54
09										.03	.97	.55
10											.09	-.14
11												.50
University Library												
12												

NOTE: Since in computing correlation coefficients program data must be available for both of the measures being correlated, the actual number of programs on which each coefficient is based varies.

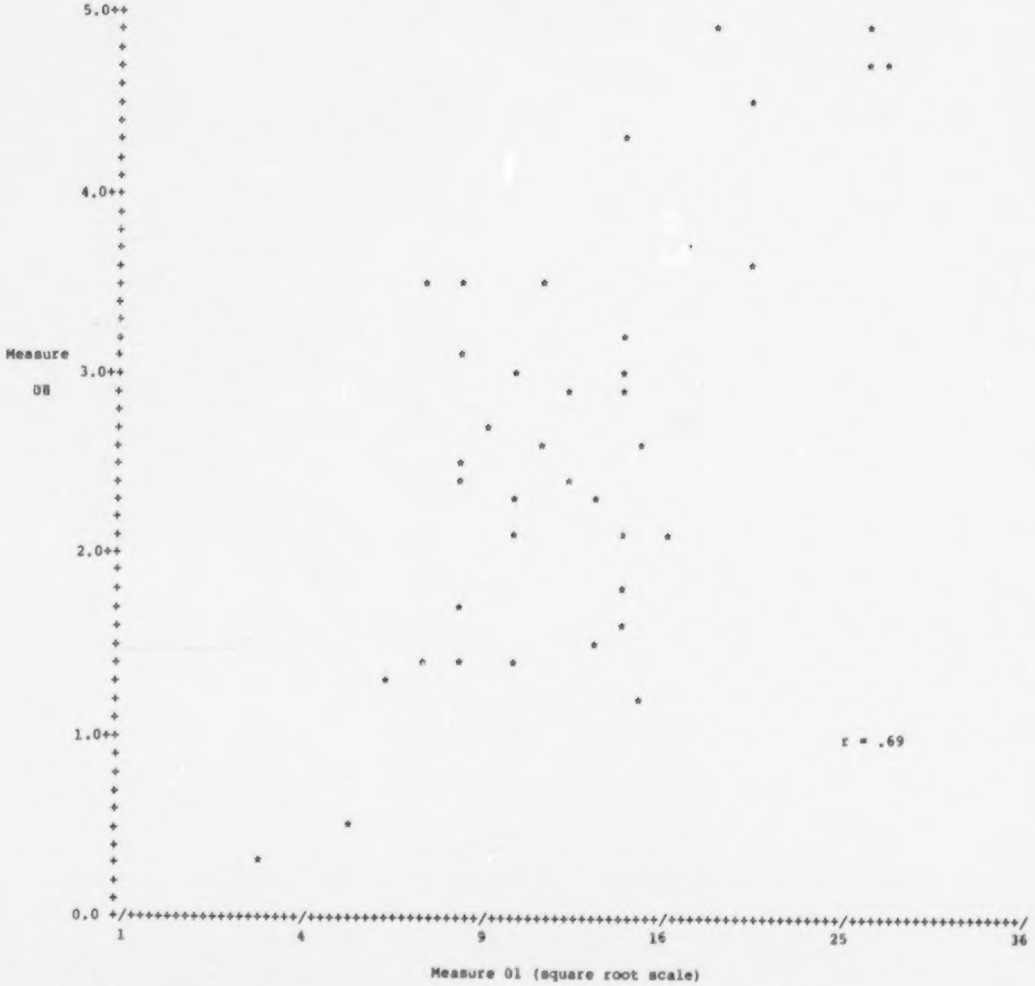

FIGURE 3.1 Mean rating of scholarly quality of faculty (measure 08) versus number of faculty members (measure 01)--41 programs in art history.

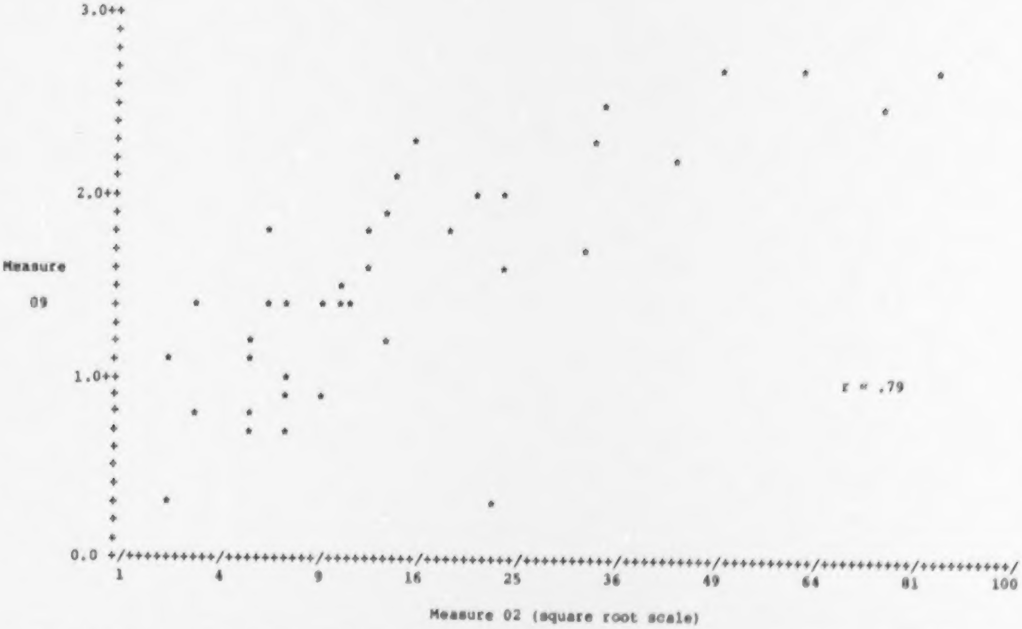

FIGURE 3.2 Mean rating of program effectiveness in educating research scholars/scientists (measure 09) versus number of graduates in last five years (measure 02)--41 programs in art history.

TABLE 3.4 Characteristics of Survey Participants in Art History

	Respondents	
	N	%
Field of Specialization		
Art History & Appreciation	94	100
Faculty Rank		
Professor	52	55
Associate Professor	24	26
Assistant Professor	17	18
Other/Unknown	1	1
Year of Highest Degree		
Pre-1950	5	5
1950-59	17	18
1960-69	31	33
Post-1969	41	44
Evaluator Selection		
Nominated by Institution	76	81
Other	18	19
Survey Form		
With Faculty Names	85	90
Without Names	9	10
Total Evaluators	94	100

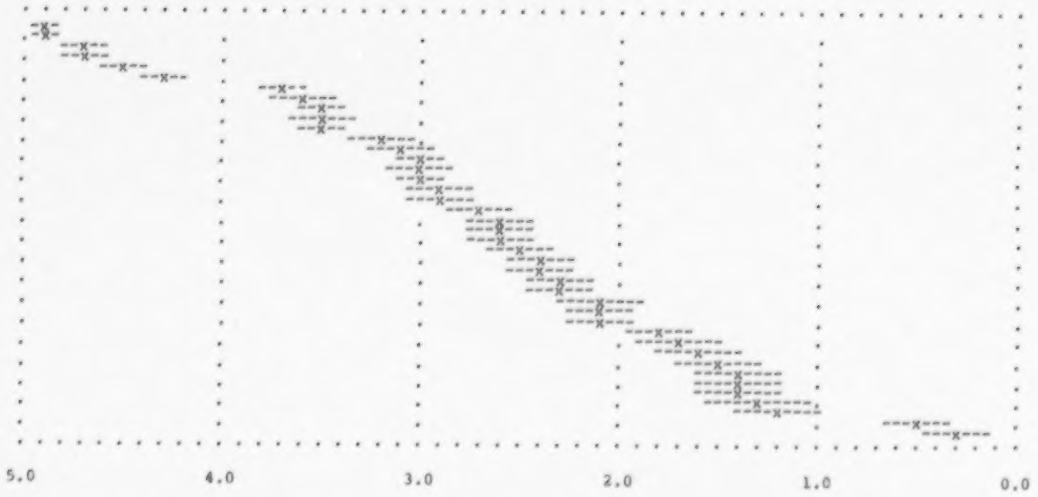

FIGURE 3.3 Mean rating of scholarly quality of faculty in 41 programs in art history.

NOTE: Programs are listed in sequence of mean rating, with the highest-rated program appearing at the top of the page. The broken lines (---) indicate a confidence interval of ±1.5 standard errors around the reported mean (x) of each program.

IV

Classics Programs

In this chapter 35 research-doctorate programs in the classics are assessed. These programs, according to the information supplied by their universities, have accounted for 334 doctoral degrees awarded during the FY1976-80 period.[1] On the average, 17 full-time and part-time students intending to earn doctorates were enrolled in a program in December 1980, with an average faculty size of 11 members.[2] Only three of the programs were initiated since 1970, and no two programs are located in the same university. In addition to the 35 institutions represented in this discipline, another 6 were initially identified as meeting the criteria[3] for inclusion in the assessment:

University of Dallas
Saint Louis University
SUNY at Albany
Tufts University
Western Conservative Baptist
  Seminary--Oregon
Yeshiva University

Classics programs at these six institutions have not been included in the evaluations in this discipline, since in each case the study coordinator either indicated that the institution did not at that time have a research-doctorate program in classics or failed to provide the information requested by the committee.

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[1] Data from the NRC's Survey of Earned Doctorates indicate that 316 research doctorates in classical languages and literature were awarded by U.S. universities between FY1976 and FY1980. Since the NRC figure is based on field of degree and not department, it may exclude some doctorates included in the numbers reported by institutional coordinators.

[2] See the reported means for measures 03 and 01 in Table 4.2.

[3] As mentioned in Chapter I, the primary criterion for inclusion was that a university had awarded at least 3 doctorates in the classics during the FY1976-78 period.

Before examining individual program results presented in Table 4.1, the reader is urged to refer to Chapter II, in which each of the 12 measures used in the assessment is discussed. Summary statistics describing every measure are given in Table 4.2. For eight of the measures, data are reported for at least 31 of the 35 classics programs. For measures 04-07, which pertain to characteristics of the program graduates, data are presented for less than half of the programs; the other programs had too few graduates on which to base statistics.[4]

Intercorrelations among the 12 measures (Pearson product-moment coefficients) are given in Table 4.3. Of particular note are the high positive correlations of the measures of program size (01-03) with reputational survey ratings (08, 09). Figure 4.1 illustrates the relation between the mean rating of the scholarly quality of faculty (measure 08) and the number of faculty members (measure 01) for each of 35 programs in the classics. Figure 4.2 plots the mean rating of program effectiveness (measure 09) against the total number of FY1976-80 program graduates (measure 02). In both figures there is a significant positive correlation between program size and reputational rating.

Table 4.4 describes the 100 faculty members who participated in the evaluation of classics programs. These individuals constituted 67 percent of those asked to respond to the survey in this discipline and 27 percent of the faculty population in the 35 research-doctorate programs being evaluated.[5] More than one-third of the survey participants had earned their highest degree since 1970, and almost half held the rank of full professor.

To assist the reader in interpreting results of the survey evaluations, estimated standard errors have been computed for mean ratings of the scholarly quality of faculty in 35 classics programs (and are given in Table 4.1). For each program the mean rating and an associated "confidence interval" of 1.5 standard errors are illustrated in Figure 4.3 (listed in order of highest to lowest mean rating). In comparing two programs, if their confidence intervals do not overlap, one may conclude that there is a significant difference in their mean ratings at a .05 level of significance.[6] From this figure it is also apparent that one should have somewhat more confidence in the accuracy

of the mean ratings of higher-rated programs than lower-rated programs. This generalization results primarily from the fact that evaluators are not as likely to be familiar with the less prestigious programs, and consequently the mean ratings of these programs are usually based on fewer survey responses.

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[4] As mentioned in Chapter II, data for measures 04-07 are not reported if they are based on the survey responses of fewer than 10 FY1975-79 program graduates.

[5] See Table 2.3 in Chapter II.

[6] See pp. 28-30 for a discussion of the interpretation of mean ratings and associated confidence intervals.

TABLE 4.1 Program Measures (Raw and Standardized Values) in Classics

Prog No.	University - Department/Academic Unit	Program Size (01)	(02)	(03)	Characteristics of Program Graduates (04)	(05)	(06)	(07)
001.	Boston University	8	5	8	NA	NA	NA	NA
	*Classical Studies**	*43*	*43*	*41*				
002.	Brown University	10	13	24	.08	6.0	.46	.15
	Classics	*48*	*55*	*57*	*36*	*61*	*41*	*38*
003.	Bryn Mawr College	12	14	43	.17	8.0	.42	.25
	Classics	*53*	*57*	*77*	*42*	*48*	*38*	*45*
004.	California, University of-Berkeley	17	9	30	.31	8.0	.69	.62
	Classics	*66*	*49*	*63*	*52*	*48*	*58*	*70*
005.	California, University of-Los Angeles	12	3	18	NA	NA	NA	NA
	Classics	*53*	*40*	*51*				
006.	Catholic University of America	8	6	6	NA	NA	NA	NA
	Greek and Latin	*43*	*45*	*39*				
007.	Chicago, University of	11	4	9	NA	NA	NA	NA
	Classical Languages and Literatures	*51*	*41*	*42*				
008.	Cincinnati, University of	11	8	18	NA	NA	NA	NA
	Classics	*51*	*48*	*51*				
009.	Columbia University	12	8	30	NA	NA	NA	NA
	Classics	*53*	*48*	*63*				
010.	Cornell University-Ithaca	12	7	13	NA	NA	NA	NA
	Classics	*53*	*46*	*46*				
011.	Duke University	8	9	12	.42	6.0	.58	.33
	Classical Studies	*43*	*49*	*45*	*60*	*61*	*50*	*51*
012.	Fordham University	6	3	16	NA	NA	NA	NA
	Classical Languages and Literatures	*38*	*40*	*49*				
013.	Harvard University	19	36	36	.29	7.5	.71	.54
	The Classics	*71*	*91*	*70*	*51*	*51*	*60*	*65*
014.	Illinois, University-Urbana/Champaign	9	15	15	.25	8.5	.42	.25
	Classics	*46*	*58*	*48*	*48*	*45*	*38*	*45*
015.	Indiana University-Bloomington	10	6	10	NA	NA	NA	NA
	Classical Studies	*48*	*45*	*43*				
016.	Iowa, University of-Iowa City	8	7	9	NA	NA	NA	NA
	Classics	*43*	*46*	*42*				
017.	Johns Hopkins University	4	9	17	.30	NA	.40	.10
	Classics	*33*	*49*	*50*	*52*		*36*	*35*
018.	Loyola University of Chicago	9	6	14	NA	NA	NA	NA
	Classical Studies	*46*	*45*	*47*				
019.	Michigan, University of-Ann Arbor	15	14	26	.20	NA	.70	.40
	Classical Studies	*61*	*57*	*59*	*45*		*59*	*55*
020.	Minnesota, University of	11	11	30	.07	11.2	.75	.25
	Classics	*51*	*52*	*63*	*35*	*28*	*63*	*45*

* indicates program was initiated since 1970.

NOTE: On the first line of data for every program, raw values for each measure are reported; on the second line values are reported in standardized form, with mean = 50 and standard deviation = 10. "NA" indicates that the value for a measure is not available.

TABLE 4.1 Program Measures (Raw and Standardized Values) in Classics

Prog No.	Survey Results (08)	(09)	(10)	(11)	University Library (12)	Survey Ratings Standard Error (08)	(09)	(10)	(11)
001.	2.4	1.1	0.8	1.4	-0.4	.11	.08	.08	.06
	44	*40*	*42*	*53*	*36*				
002.	3.8	2.0	1.2	1.7	-1.1	.08	.06	.05	.05
	59	*57*	*63*	*62*	*29*				
003.	3.8	2.2	0.9	1.5	NA	.09	.06	.06	.06
	59	*62*	*47*	*57*					
004.	4.6	2.4	1.2	1.8	2.2	.06	.06	.06	.05
	67	*66*	*62*	*64*	*63*				
005.	3.1	1.4	1.3	1.4	2.0	.11	.08	.10	.06
	52	*47*	*66*	*53*	*61*				
006.	1.4	1.0	0.7	0.4	NA	.14	.11	.13	.06
	35	*39*	*41*	*27*					
007.	3.6	1.7	0.8	1.4	0.9	.09	.07	.08	.07
	57	*51*	*45*	*54*	*49*				
008.	2.9	1.8	0.7	1.1	-0.2	.10	.06	.09	.07
	50	*53*	*39*	*47*	*37*				
009.	3.7	2.0	1.0	1.5	1.7	.08	.05	.08	.06
	58	*57*	*54*	*56*	*58*				
010.	3.5	2.0	1.0	1.4	1.6	.08	.06	.08	.06
	56	*57*	*54*	*55*	*57*				
011.	2.8	1.8	1.1	1.3	0.3	.10	.07	.07	.07
	49	*53*	*58*	*51*	*44*				
012.	1.3	0.7	0.7	0.7	NA	.10	.09	.12	.07
	34	*33*	*40*	*35*					
013.	4.9	2.7	0.8	1.9	3.0	.03	.05	.06	.04
	70	*70*	*45*	*67*	*72*				
014.	3.2	1.8	1.1	1.3	2.0	.09	.07	.09	.07
	53	*53*	*57*	*53*	*61*				
015.	2.8	1.7	1.0	1.3	0.9	.09	.07	.10	.07
	48	*51*	*52*	*51*	*50*				
016.	1.9	1.2	1.0	0.8	0.3	.11	.08	.07	.07
	40	*42*	*52*	*39*	*43*				
017.	2.5	1.2	0.2	1.4	-0.4	.14	.09	.06	.06
	46	*42*	*18*	*54*	*36*				
018.	1.5	0.8	1.1	0.6	NA	.12	.10	.06	.07
	36	*34*	*59*	*34*					
019.	4.1	2.3	1.1	1.7	1.8	.07	.05	.07	.05
	61	*63*	*57*	*62*	*59*				
020.	2.4	1.5	1.0	1.0	1.2	.10	.09	.10	.07
	44	*48*	*56*	*45*	*52*				

NOTE: On the first line of data for every program, raw values for each measure are reported; on the second line values are reported in standardized form, with mean = 50 and standard deviation = 10. "NA" indicates that the value for a measure is not available.

TABLE 4.1 Program Measures (Raw and Standardized Values) in Classics

Prog No.	University - Department/Academic Unit	Program Size			Characteristics of Program Graduates			
		(01)	(02)	(03)	(04)	(05)	(06)	(07)
021.	Missouri, University of-Columbia	5	3	4	NA	NA	NA	NA
	*Classics and Classical Archaeology**	*36*	*40*	*37*				
022.	New York University	5	4	3	NA	NA	NA	NA
	Classics	*36*	*41*	*36*				
023.	North Carolina, University of-Chapel Hill	15	24	11	.28	8.7	.58	.21
	Classics	*61*	*72*	*44*	*50*	*44*	*50*	*42*
024.	Ohio State University-Columbus	11	11	18	.25	6.0	.60	.20
	Classics	*51*	*52*	*51*	*48*	*61*	*52*	*42*
025.	Pennsylvania, University of	11	7	5	NA	NA	NA	NA
	Classical Studies	*51*	*46*	*38*				
026.	Princeton University	13	12	25	.47	5.8	.67	.47
	Classics	*56*	*54*	*58*	*64*	*62*	*57*	*60*
027.	Rutgers, The State University-New Brunswick	8	3	15	NA	NA	NA	NA
	Classics	*43*	*40*	*48*				
028.	SUNY at Buffalo	8	11	16	.18	7.8	.36	.27
	Classics	*43*	*52*	*49*	*43*	*50*	*34*	*47*
029.	Stanford University	12	12	15	.64	7.5	.79	.50
	Classics	*53*	*54*	*48*	*77*	*51*	*66*	*62*
030.	Texas, University of-Austin	22	13	25	.29	10.5	.50	.21
	Classics	*79*	*55*	*58*	*51*	*33*	*44*	*42*
031.	Vanderbilt University	6	7	5	NA	NA	NA	NA
	Classical Studies	*38*	*46*	*38*				
032.	Virginia, University of	9	2	6	NA	NA	NA	NA
	Classics	*46*	*38*	*39*				
033.	Washington, University of-Seattle	9	8	12	NA	NA	NA	NA
	Classics	*46*	*48*	*45*				
034.	Wisconsin, University of-Madison	10	6	14	NA	NA	NA	NA
	Classics	*48*	*45*	*47*				
035.	Yale University	17	18	33	.22	6.3	.65	.41
	Classical Languages and Literatures	*66*	*63*	*66*	*46*	*59*	*55*	*56*

* indicates program was initiated since 1970.

NOTE: On the first line of data for every program, raw values for each measure are reported; on the second line values are reported in standardized form, with mean = 50 and standard deviation = 10. "NA" indicates that the value for a measure is not available.

TABLE 4.1 Program Measures (Raw and Standardized Values) in Classics

Prog	Survey Results				University Library	Survey Ratings Standard Error			
No.	(08)	(09)	(10)	(11)	(12)	(08)	(09)	(10)	(11)
021.	1.5	1.0	0.8	0.8	-0.2	.14	.10	.09	.06
	36	*39*	*43*	*37*	*38*				
022.	2.1	0.9	0.6	1.0	0.5	.11	.08	.07	.07
	42	*36*	*33*	*44*	*45*				
023.	3.9	2.3	0.9	1.6	1.0	.06	.05	.08	.06
	60	*63*	*49*	*59*	*50*				
024.	2.6	1.5	1.0	1.3	0.9	.09	.07	.07	.06
	47	*48*	*54*	*51*	*49*				
025.	3.7	1.9	0.9	1.5	0.7	.08	.07	.08	.06
	57	*56*	*48*	*56*	*47*				
026.	4.1	2.3	1.1	1.7	0.9	.08	.07	.08	.05
	62	*63*	*58*	*63*	*49*				
027.	1.9	1.0	1.0	0.9	0.8	.11	.09	.08	.07
	39	*37*	*52*	*42*	*48*				
028.	2.7	1.5	0.7	1.0	0.3	.10	.08	.09	.07
	47	*47*	*41*	*44*	*43*				
029.	3.4	2.0	0.7	1.4	2.0	.08	.04	.09	.06
	55	*58*	*40*	*54*	*61*				
030.	3.8	2.0	1.3	1.6	1.6	.06	.06	.07	.05
	58	*58*	*67*	*60*	*57*				
031.	1.4	0.9	0.9	0.7	-0.7	.11	.10	.09	.06
	34	*36*	*48*	*36*	*32*				
032.	1.9	1.0	1.2	0.9	0.7	.11	.11	.09	.06
	40	*37*	*63*	*39*	*48*				
033.	2.2	1.4	0.9	0.8	1.5	.10	.09	.09	.06
	42	*46*	*48*	*38*	*55*				
034.	2.6	1.5	0.8	1.0	1.6	.10	.08	.06	.07
	47	*48*	*43*	*44*	*56*				
035.	4.4	2.2	1.1	1.7	2.1	.07	.06	.08	.05
	65	*61*	*58*	*62*	*62*				

NOTE: On the first line of data for every program, raw values for each measure are reported; on the second line values are reported in standardized form, with mean = 50 and standard deviation = 10. "NA" indicates that the value for a measure is not available.

TABLE 4.2 Summary Statistics Describing Each Program Measure--Classics

Measure	Number of Programs Evaluated	Mean	Standard Deviation	DECILES 1	2	3	4	5	6	7	8	9
Program Size												
01 Raw Value	35	11	4	6	8	8	9	10	11	12	12	16
Std Value	35	50	10	38	43	43	46	48	51	53	53	64
02 Raw Value	35	10	7	3	4	6	7	8	9	11	13	15
Std Value	35	50	10	40	42	45	46	48	49	52	55	58
03 Raw Value	35	17	10	5	8	11	13	15	16	18	25	30
Std Value	35	50	10	38	41	44	46	48	49	51	58	63
Program Graduates												
04 Raw Value	16	.28	.14	.08	.17	.20	.23	.25	.28	.29	.31	.44
Std Value	16	50	10	36	42	44	46	48	50	51	52	61
05 Raw Value	14	7.7	1.6	10.9	9.0	8.4	8.0	7.8	7.5	6.5	6.0	6.0
Std Value	14	50	10	30	42	46	48	49	51	57	60	60
06 Raw Value	16	.58	.13	.39	.42	.45	.53	.58	.63	.67	.70	.73
Std Value	16	50	10	35	38	40	46	50	54	57	59	62
07 Raw Value	16	.32	.14	.13	.20	.21	.25	.25	.31	.40	.46	.52
Std Value	16	50	10	36	41	42	45	45	49	56	60	64
Survey Results												
08 Raw Value	35	2.9	1.0	1.4	1.9	2.3	2.6	2.8	3.2	3.6	3.8	4.1
Std Value	35	50	10	35	40	44	47	49	53	57	59	62
09 Raw Value	35	1.6	.5	.9	1.0	1.2	1.5	1.6	1.8	2.0	2.0	2.3
Std Value	35	50	10	36	38	42	48	50	54	58	58	63
10 Raw Value	35	.9	.2	.7	.7	.8	.9	.9	1.0	1.1	1.1	1.2
Std Value	35	50	10	40	40	44	49	49	54	59	59	63
11 Raw Value	35	1.2	.4	.7	.8	1.0	1.1	1.3	1.4	1.4	1.6	1.7
Std Value	35	50	10	35	38	44	46	52	54	54	60	62
University Library												
12 Raw Value	31	1.0	1.0	-.4	-.1	.4	.8	.9	1.1	1.6	1.8	2.0
Std Value	31	50	10	36	39	44	48	49	52	57	59	61

NOTE: Standardized values reported in the preceding table have been computed from exact values of the mean and standard deviation and not the rounded values reported here.

TABLE 4.3 Intercorrelations Among Program Measures on 35 Programs in Classics

	Measure											
	01	02	03	04	05	06	07	08	09	10	11	12
Program Size												
01		.63	.64	.04	-.30	.45	.49	.81	.80	.52	.71	.69
02			.58	-.05	-.03	.21	.25	.66	.72	.07	.61	.44
03				-.38	-.12	.18	.32	.65	.66	.28	.61	.53
Program Graduates												
04					.29	.38	.49	.10	.17	-.20	.14	.27
05						-.02	.21	.18	.14	-.05	.26	-.29
06							.70	.34	.44	.24	.29	.59
07								.64	.69	.21	.48	.71
Survey Results												
08									.96	.31	.95	.59
09										.30	.88	.59
10											.25	.33
11												.45
University Library												
12												

NOTE: Since in computing correlation coefficients program data must be available for both of the measures being correlated, the actual number of programs on which each coefficient is based varies.

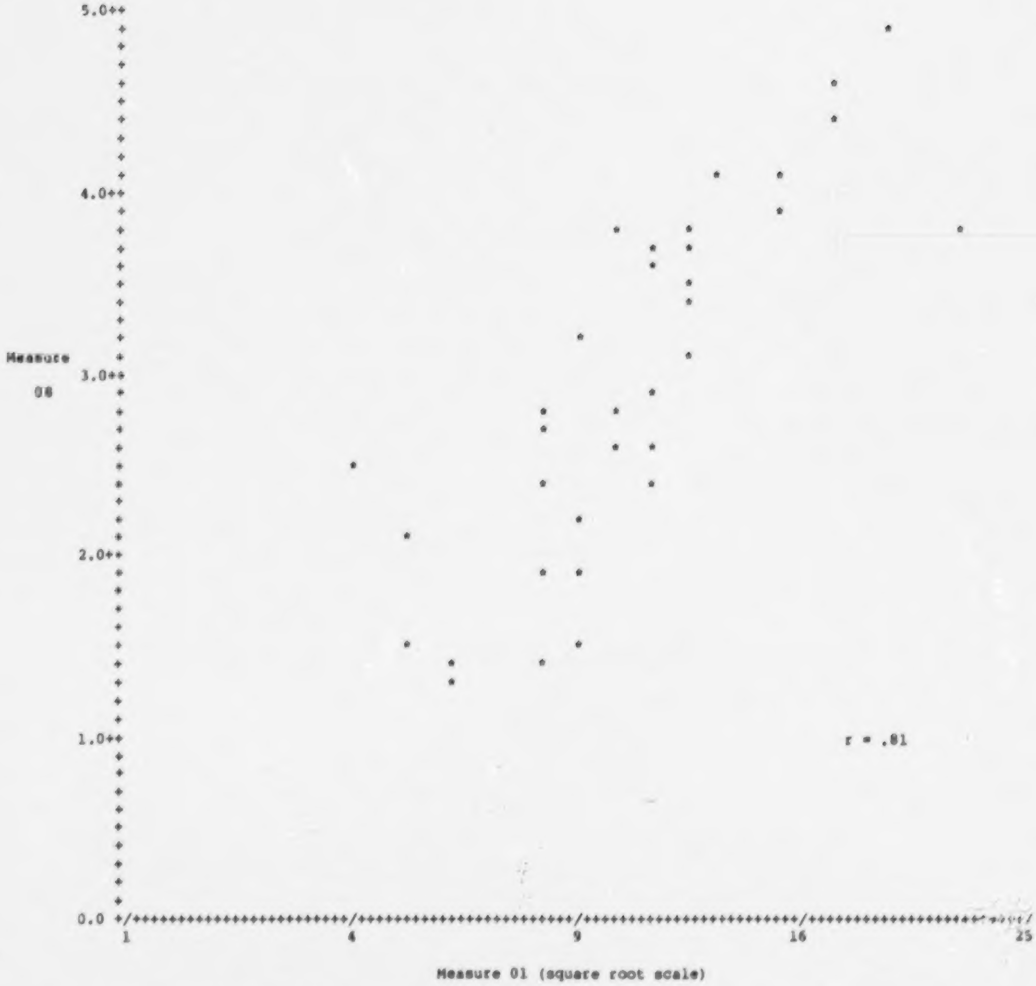


FIGURE 4.1 Mean rating of scholarly quality of faculty (measure 08) versus number of faculty members (measure 01)--35 programs in classics.

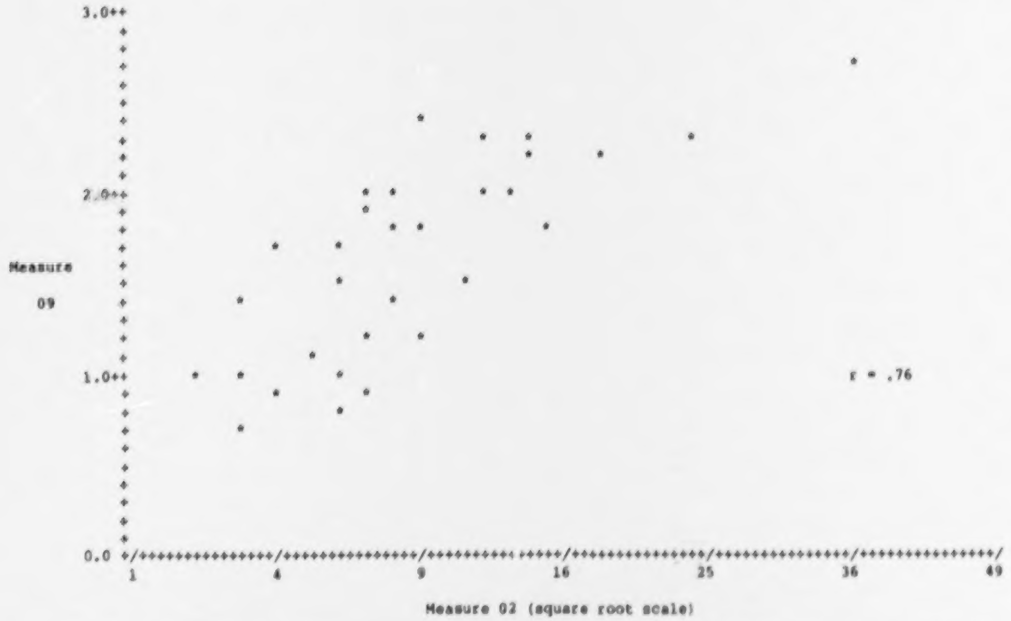
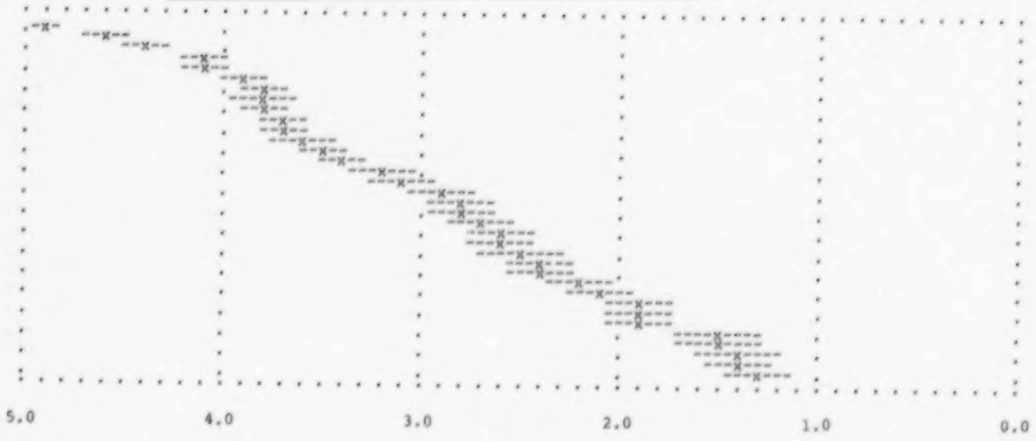


FIGURE 4.2 Mean rating of program effectiveness in educating research scholars/scientists (measure 09) versus number of graduates in last five years (measure 02)--35 programs in classics.

TABLE 4.4 Characteristics of Survey Participants in Classics

	Respondents	
	N	%
Field of Specialization		
Classics	93	93
Other/Unknown	7	7
Faculty Rank		
Professor	47	47
Associate Professor	32	32
Assistant Professor	21	21
Year of Highest Degree		
Pre-1950	8	8
1950-59	17	17
1960-69	39	39
Post-1969	35	35
Unknown	1	1
Evaluator Selection		
Nominated by Institution	79	79
Other	21	21
Survey Form		
With Faculty Names	88	88
Without Names	12	12
Total Evaluators	100	100



Mean Survey Rating (measure 08)

FIGURE 4.3 Mean rating of scholarly quality of faculty in 35 programs in classics.

NOTE: Programs are listed in sequence of mean rating, with the highest-rated program appearing at the top of the page. The broken lines (---) indicate a confidence interval of ±1.5 standard errors around the reported mean (x) of each program.

V

English Language and Literature Programs

In this chapter 106 research-doctorate programs in English language and literature are assessed. These programs, according to the information supplied by their universities, have accounted for 4,687 doctoral degrees awarded during the FY1976-80 period--approximately 90 percent of the aggregate number of English and American language and literature doctorates earned from U.S. universities in this five-year span.[1] On the average, 62 full-time and part-time students intending to earn doctorates were enrolled in a program in December 1980, with an average faculty size of 31 members.[2] Only three of the programs were initiated since 1970, and no two programs are located in the same university. In addition to the 106 institutions represented in this discipline, another 5 were initially identified as meeting the criteria[3] for inclusion in the assessment:

University of Detroit
Idaho State University--Pocatello
Middle Tennessee State University
SUNY at Albany
Saint John's University

The last institution chose not to participate in the assessment in any discipline. English programs at the other four institutions have not been included in the evaluations in this discipline, since in each case the study coordinator either indicated that the institution did not at that time have a research-doctorate program in English or failed to provide the information requested by the committee.

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[1] Data from the NRC's Survey of Earned Doctorates indicate that 4,096 research doctorates in English language and literature and 1,087 research doctorates in American language and literature were awarded by U.S. universities between FY1976 and FY1980.

[2] See the reported means for measures 03 and 01 in Table 5.2.

[3] As mentioned in Chapter I, the primary criterion for inclusion was that a university had awarded at least 13 doctorates in English during the FY1976-78 period.

Before examining individual program results presented in Table 5.1, the reader is urged to refer to Chapter II, in which each of the 12 measures used in the assessment is discussed. Summary statistics describing every measure are given in Table 5.2. For 11 of the measures, data are reported for at least 103 of the 106 English programs. For measure 12, a composite index of the size of a university library, data are available for 75 programs. The programs not evaluated on measure 12 are typically smaller--in terms of faculty size and graduate student enrollment--than other English programs. Were data on this measure available for all 106 programs, it is likely that the reported mean would be appreciably lower (and that some of the correlations of this measure with others would be higher).

Intercorrelations among the 12 measures (Pearson product-moment coefficients) are given in Table 5.3. Of particular note are the high positive correlations of the measures of numbers of recent program graduates (02) and library index (12) with reputational survey ratings (08, 09). Figure 5.1 illustrates the relation between the mean rating of the scholarly quality of faculty (measure 08) and the number of faculty members (measure 01) for each of 106 programs in English. Figure 5.2 plots the mean rating of program effectiveness (measure 09) against the total number of FY1976-80 program graduates (measure 02). Although in both figures there is a significant positive correlation between program size and reputational rating, it is quite apparent that some of the smaller programs received high mean ratings and that some of the larger programs received low mean ratings.

Table 5.4 describes the 198 faculty members who participated in the evaluation of English programs. These individuals constituted 62 percent of those asked to respond to the survey in this discipline and 6 percent of the faculty population in the 106 research-doctorate programs being evaluated.[*] More than two-thirds of the survey participants had earned their highest degree before 1970, and a majority held the rank of full professor.

One exception should be noted with regard to the survey evaluations in this discipline. It has been called to the attention of the committee that the University of Chicago program in the department of English was labeled "Humanities" on the survey form. The committee has decided to report the survey results for this program but cautions that the reputational ratings may have been influenced by the use of an inaccurate department title.

To assist the reader in interpreting results of the survey evaluations, estimated standard errors have been computed for mean ratings of the scholarly quality of faculty in 106 English programs (and are given in Table 5.1). For each program the mean rating and an associated "confidence interval" of 1.5 standard errors are illustrated in Figure 5.3 (listed in order of highest to lowest mean rating). In comparing two programs, if their confidence intervals do not overlap, one may conclude that there is a significant difference in their mean ratings at a .05 level of significance.[5] From this figure it is also apparent that one should have somewhat more confidence in the accuracy of the mean ratings of higher-rated programs than lower-rated programs. This generalization results primarily from the fact that evaluators are not as likely to be familiar with the less prestigious programs, and consequently the mean ratings of these programs are usually based on fewer survey responses.

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[*] See Table 2.3 in Chapter II.

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[5] See pp. 28-30 for a discussion of the interpretation of mean ratings and associated confidence intervals.

TABLE 5.1 Program Measures (Raw and Standardized Values) in English Lang. & Lit.

Prog No.	University - Department/Academic Unit	Program Size (01)	(02)	(03)	Characteristics of Program Graduates (04)	(05)	(06)	(07)
001.	American University	11	29	14	.04	6.0	.50	.20
	*Literature**	*36*	*45*	*40*	*36*	*69*	*44*	*50*
002.	Arizona State University-Tempe	37	27	44	.33	10.8	.46	.08
	English	*54*	*44*	*46*	*61*	*40*	*41*	*38*
003.	Arizona, University of-Tucson	38	27	31	.30	11.0	.58	.29
	English	*55*	*44*	*44*	*59*	*38*	*51*	*59*
004.	Arkansas, University-Fayetteville	24	34	28	.19	12.6	.60	.23
	English	*45*	*47*	*43*	*50*	*28*	*53*	*53*
005.	Auburn University	22	19	37	.26	10.5	.56	.11
	English	*44*	*42*	*45*	*56*	*41*	*49*	*41*
006.	Ball State University	39	28	65	NA	NA	NA	NA
	English	*56*	*45*	*51*				
007.	Boston College	19	16	26	.06	5.4	.65	.29
	English	*42*	*41*	*42*	*38*	*73*	*57*	*59*
008.	Boston University	39	28	33	.22	11.2	.54	.22
	English	*56*	*45*	*44*	*52*	*37*	*48*	*51*
009.	Bowling Green State University	26	44	35	.06	9.0	.66	.13
	English	*47*	*50*	*44*	*39*	*51*	*58*	*42*
010.	Brandeis University	16	35	32	.15	8.2	.42	.21
	English and American Literature	*40*	*47*	*44*	*46*	*55*	*38*	*51*
011.	Brown University	34	56	86	.30	8.0	.51	.31
	English	*52*	*54*	*55*	*59*	*57*	*45*	*61*
012.	Bryn Mawr College	12	8	27	NA	9.5	NA	NA
	English	*37*	*38*	*43*		*48*		
013.	CUNY-Graduate School	21	61	126	.31	9.8	.29	.09
	English	*43*	*55*	*63*	*60*	*46*	*26*	*39*
014.	California, University of-Berkeley	60	112	143	.23	9.1	.52	.26
	English	*70*	*72*	*67*	*53*	*50*	*46*	*55*
015.	California, University of-Davis	23	30	46	.28	9.6	.29	.07
	English	*45*	*45*	*47*	*57*	*47*	*26*	*37*
016.	California, University of-Irvine	26	28	48	.19	8.0	.50	.17
	English	*47*	*45*	*47*	*50*	*57*	*44*	*46*
017.	California, University of-Los Angeles	77	65	101	.21	7.8	.53	.31
	English	*82*	*57*	*58*	*51*	*58*	*47*	*60*
018.	California, University of-Riverside	17	10	34	.21	8.2	.57	.36
	English	*40*	*39*	*44*	*51*	*56*	*50*	*65*
019.	California, University of-San Diego	21	22	23	.25	8.5	.50	.31
	Literature	*43*	*43*	*42*	*54*	*54*	*44*	*60*
020.	California, University of-Santa Barbara	32	26	25	.22	8.8	.48	.35
	English	*51*	*44*	*42*	*52*	*52*	*42*	*64*

* indicates program was initiated since 1970.

NOTE: On the first line of data for every program, raw values for each measure are reported; on the second line values are reported in standardized form, with mean = 50 and standard deviation = 10. "NA" indicates that the value for a measure is not available.

TABLE 5.1 Program Measures (Raw and Standardized Values) in English Lang. & Lit.

Prog	Survey Results				University Library	Survey Ratings Standard Error			
No.	(08)	(09)	(10)	(11)	(12)	(08)	(09)	(10)	(11)
001.	1.1	0.7	0.8	0.4	NA	.14	.13	.12	.06
	36	*34*	*39*	*39*					
002.	1.8	1.2	1.4	0.6	-0.3	.13	.11	.12	.06
	43	*44*	*65*	*43*	*45*				
003.	2.1	1.4	1.4	0.6	0.9	.13	.12	.09	.07
	46	*48*	*66*	*43*	*57*				
004.	1.5	1.1	1.1	0.5	NA	.14	.12	.14	.06
	40	*41*	*56*	*41*					
005.	1.0	0.7	1.0	0.3	NA	.13	.13	.13	.05
	36	*34*	*50*	*37*					
006.	1.3	0.9	1.2	0.3	NA	.13	.11	.14	.06
	38	*37*	*58*	*38*					
007.	1.7	0.9	1.0	0.5	NA	.14	.12	.13	.06
	42	*38*	*50*	*42*					
008.	2.8	1.4	1.1	1.0	-0.4	.10	.09	.12	.06
	53	*48*	*52*	*53*	*45*				
009.	1.3	1.0	1.2	0.4	NA	.15	.13	.14	.06
	39	*40*	*58*	*39*					
010.	2.4	1.6	0.7	0.7	NA	.14	.12	.09	.06
	49	*52*	*37*	*46*					
011.	3.9	2.2	1.2	1.5	-1.1	.07	.06	.07	.06
	64	*63*	*57*	*64*	*38*				
012.	1.6	1.2	0.7	0.4	NA	.16	.15	.13	.06
	41	*44*	*37*	*40*					
013.	3.9	2.0	1.2	1.3	NA	.09	.10	.10	.08
	63	*59*	*59*	*60*					
014.	4.7	2.6	0.9	1.7	2.2	.05	.06	.08	.05
	71	*70*	*45*	*70*	*70*				
015.	2.6	1.5	1.3	1.0	0.6	.11	.10	.09	.07
	51	*49*	*61*	*52*	*55*				
016.	3.3	1.9	1.5	1.2	NA	.10	.08	.11	.06
	57	*57*	*71*	*58*					
017.	4.0	2.2	1.3	1.5	2.0	.07	.05	.08	.06
	64	*63*	*62*	*65*	*68*				
018.	2.3	1.4	0.8	0.8	-1.0	.11	.09	.13	.07
	48	*47*	*41*	*48*	*39*				
019.	3.1	1.8	1.1	1.1	-0.0	.08	.08	.11	.06
	56	*55*	*52*	*55*	*48*				
020.	2.9	1.5	1.0	1.0	-0.1	.10	.08	.12	.07
	54	*50*	*48*	*53*	*47*				

NOTE: On the first line of data for every program, raw values for each measure are reported; on the second line values are reported in standardized form, with mean = 50 and standard deviation = 10. "NA" indicates that the value for a measure is not available.

TABLE 5.1 Program Measures (Raw and Standardized Values) in English Lang. & Lit.

Prog No.	University - Department/Academic Unit	Program Size (01)	(02)	(03)	Characteristics of Program Graduates (04)	(05)	(06)	(07)
021.	Case Western Reserve University	11	24	26	.24	9.8	.33	.13
	English	*36*	*43*	*42*	*54*	*46*	*30*	*43*
022.	Catholic University of America	9	17	30	.28	12.0	.59	.12
	English	*35*	*41*	*43*	*57*	*32*	*52*	*41*
023.	Chicago, University of	33	96	72	.39	7.3	.65	.40
	English	*51*	*67*	*52*	*66*	*61*	*57*	*69*
024.	Claremont Graduate School	10	10	29	.50	9.5	.58	.25
	English	*36*	*39*	*43*	*76*	*48*	*51*	*55*
025.	Colorado, University of	35	31	84	.20	10.4	.41	.16
	English	*53*	*46*	*55*	*50*	*42*	*36*	*46*
026.	Columbia University	34	138	337	.30	8.0	.52	.20
	English and Comparative Literature	*52*	*80*	*99*	*59*	*57*	*46*	*50*
027.	Connecticut, University of-Storrs	30	45	34	.28	10.0	.74	.24
	English	*49*	*50*	*44*	*57*	*44*	*64*	*53*
028.	Cornell University-Ithaca	43	48	69	.39	6.2	.72	.37
	English Language and Literature	*58*	*51*	*51*	*67*	*68*	*63*	*66*
029.	Delaware, University of-Newark	36	16	32	.12	10.2	.47	.12
	English	*53*	*41*	*44*	*43*	*43*	*42*	*41*
030.	Denver, University of	19	44	46	.10	9.9	.45	.10
	English	*42*	*50*	*47*	*41*	*45*	*40*	*40*
031.	Duke University	21	46	76	.26	7.8	.52	.18
	English	*43*	*51*	*53*	*55*	*58*	*46*	*48*
032.	Emory University	18	36	37	.37	8.8	.57	.20
	English	*41*	*47*	*45*	*65*	*52*	*50*	*50*
033.	Florida State University-Tallahassee	19	48	18	.12	8.3	.69	.28
	English	*42*	*51*	*41*	*43*	*55*	*60*	*58*
034.	Florida, University of-Gainesville	47	42	59	.14	8.0	.33	.12
	English	*61*	*49*	*49*	*45*	*57*	*30*	*42*
035.	Fordham University	16	34	48	.03	13.0	.49	.09
	English Language and Literature	*40*	*47*	*47*	*36*	*26*	*43*	*39*
036.	Georgia State University-Atlanta	12	19	34	.11	11.3	.53	.11
	English	*37*	*42*	*44*	*42*	*36*	*46*	*40*
037.	Georgia, University of-Athens	17	15	21	.18	13.3	.82	.00
	English	*40*	*41*	*41*	*48*	*24*	*72*	*30*
038.	Harvard University	33	34	91	.36	7.6	.77	.36
	English and American Literature & Language	*51*	*47*	*56*	*63*	*59*	*67*	*66*
039.	Illinois, University-Urbana/Champaign	39	88	58	.15	8.0	.52	.26
	English	*56*	*64*	*49*	*46*	*57*	*46*	*55*
040.	Indiana University-Bloomington	61	127	184	.12	8.9	.67	.22
	English	*71*	*77*	*75*	*43*	*51*	*58*	*51*

* indicates program was initiated since 1970.

NOTE: On the first line of data for every program, raw values for each measure are reported; on the second line values are reported in standardized form, with mean = 50 and standard deviation = 10. "NA" indicates that the value for a measure is not available.

TABLE 5.1 Program Measures (Raw and Standardized Values) in English Lang. & Lit.

Prog No.	Survey Results				University Library	Survey Ratings Standard Error			
	(08)	(09)	(10)	(11)	(12)	(08)	(09)	(10)	(11)
021.	1.5	1.0	0.6	0.5	-1.3	.14	.12	.11	.06
	41	*39*	*34*	*42*	*36*				
022.	0.6	0.6	0.6	0.3	NA	.11	.17	.17	.05
	32	*33*	*32*	*37*					
023.	4.4	2.4	1.1	1.6	0.9	.07	.06	.08	.05
	68	*67*	*52*	*68*	*57*				
024.	2.5	1.8	0.6	0.7	NA	.17	.10	.10	.07
	50	*55*	*33*	*45*					
025.	2.5	1.6	1.1	0.8	-0.9	.11	.07	.12	.06
	50	*52*	*52*	*48*	*40*				
026.	4.4	2.3	1.1	1.7	1.7	.07	.06	.08	.05
	68	*64*	*54*	*68*	*65*				
027.	2.2	1.4	0.8	0.7	-0.5	.10	.11	.10	.06
	47	*47*	*42*	*45*	*44*				
028.	4.3	2.6	1.3	1.6	1.6	.08	.05	.08	.06
	67	*69*	*62*	*67*	*64*				
029.	2.3	1.4	1.5	0.7	NA	.12	.11	.12	.07
	48	*47*	*70*	*47*					
030.	1.2	0.9	0.9	0.3	NA	.14	.12	.06	.06
	37	*37*	*47*	*37*					
031.	3.2	1.9	0.9	1.0	0.3	.09	.07	.10	.07
	57	*57*	*44*	*52*	*52*				
032.	2.7	1.8	1.1	0.8	-0.6	.12	.08	.11	.07
	52	*55*	*53*	*50*	*43*				
033.	1.3	0.9	0.8	0.3	-0.4	.13	.11	.11	.05
	39	*38*	*42*	*38*	*44*				
034.	2.2	1.3	1.2	0.8	0.8	.11	.10	.11	.06
	47	*47*	*57*	*48*	*56*				
035.	1.6	1.2	0.5	0.4	NA	.13	.12	.16	.06
	42	*44*	*28*	*39*					
036.	0.5	0.5	NA	0.3	NA	.08	.10	NA	.05
	31	*31*		*37*					
037.	1.6	1.2	0.9	0.5	0.4	.13	.12	.13	.07
	42	*43*	*44*	*43*	*53*				
038.	4.5	2.5	0.7	1.8	3.0	.08	.06	.07	.05
	69	*68*	*39*	*72*	*78*				
039.	3.3	2.0	0.8	1.2	2.0	.09	.06	.09	.06
	58	*59*	*39*	*58*	*68*				
040.	3.6	2.2	1.1	1.4	0.9	.09	.06	.10	.06
	60	*62*	*54*	*63*	*58*				

NOTE: On the first line of data for every program, raw values for each measure are reported; on the second line values are reported in standardized form, with mean = 50 and standard deviation = 10. "NA" indicates that the value for a measure is not available.

TABLE 5.1 Program Measures (Raw and Standardized Values) in English Lang. & Lit.

Prog No.	University - Department/Academic Unit	Program Size			Characteristics of Program Graduates			
		(01)	(02)	(03)	(04)	(05)	(06)	(07)
041.	Iowa, University of-Iowa City	53	86	149	.24	9.3	.47	.18
	English	*65*	*64*	*68*	*53*	*49*	*42*	*48*
042.	Johns Hopkins University	9	28	35	.18	5.4	.64	.43
	English	*35*	*45*	*44*	*48*	*73*	*56*	*72*
043.	Kansas State University-Manhattan	26	18	21	.12	10.8	.63	.19
	English	*47*	*42*	*41*	*43*	*40*	*55*	*48*
044.	Kansas, University of	57	35	70	.37	10.8	.50	.17
	English	*68*	*47*	*52*	*64*	*39*	*44*	*46*
045.	Kent State University	29	39	70	.03	9.8	.75	.15
	English	*49*	*48*	*52*	*35*	*46*	*65*	*45*
046.	Kentucky, University of	26	31	31	.33	10.4	.52	.10
	English	*47*	*46*	*44*	*61*	*42*	*46*	*39*
047.	Lehigh University	17	20	25	.10	8.4	.71	.10
	English	*40*	*42*	*42*	*41*	*55*	*62*	*39*
048.	Louisiana State University-Baton Rouge	33	23	24	.33	11.3	.52	.19
	English	*51*	*43*	*42*	*61*	*36*	*46*	*49*
049.	Loyola University of Chicago	27	17	37	.31	9.3	.63	.06
	English	*47*	*41*	*45*	*60*	*49*	*55*	*36*
050.	Marquette University	18	14	13	.16	8.3	.79	.32
	English	*41*	*40*	*40*	*47*	*55*	*69*	*61*
051.	Maryland, University of-College Park	49	61	195	.04	11.2	.60	.12
	English Language and Literature	*62*	*55*	*78*	*37*	*37*	*52*	*42*
052.	Massachusetts, University of-Amherst	50	69	96	.16	10.3	.54	.10
	English	*63*	*58*	*57*	*47*	*43*	*47*	*39*
053.	Michigan State University-East Lansing	46	50	78	.10	8.2	.79	.35
	English	*60*	*52*	*53*	*42*	*56*	*69*	*65*
054.	Michigan, University of-Ann Arbor	67	116	62	.22	8.2	.62	.22
	English Language and Literature	*75*	*73*	*50*	*52*	*55*	*54*	*52*
055.	Minnesota, University of	27	51	101	.28	10.9	.71	.27
	English	*47*	*52*	*58*	*57*	*39*	*62*	*56*
056.	Mississippi, University of-Oxford	18	19	21	.50	10.2	.85	.05
	English	*41*	*42*	*41*	*76*	*43*	*74*	*35*
057.	Missouri, University of-Columbia	25	19	56	.05	9.2	.45	.15
	English	*46*	*42*	*49*	*37*	*49*	*40*	*45*
058.	Nebraska, University of-Lincoln	39	60	55	.22	10.6	.46	.20
	English	*56*	*55*	*48*	*52*	*41*	*41*	*50*
059.	New Mexico, University of-Albuquerque	27	33	31	.17	7.5	.57	.30
	English	*47*	*46*	*44*	*47*	*60*	*50*	*60*
060.	New York University	28	111	97	.01	11.3	.62	.09
	English	*48*	*72*	*57*	*34*	*36*	*54*	*39*

* indicates program was initiated since 1970.

NOTE: On the first line of data for every program, raw values for each measure are reported; on the second line values are reported in standardized form, with mean = 50 and standard deviation = 10. "NA" indicates that the value for a measure is not available.

TABLE 5.1 Program Measures (Raw and Standardized Values) in English Lang. & Lit.

Prog No.	Survey Results				University Library	Survey Ratings Standard Error			
	(08)	(09)	(10)	(11)	(12)	(08)	(09)	(10)	(11)
041.	3.2	2.2	1.0	1.2	0.3	.09	.07	.09	.06
	57	*62*	*51*	*59*	*51*				
042.	4.3	2.5	0.8	1.7	-0.4	.08	.07	.09	.06
	67	*67*	*41*	*68*	*45*				
043.	1.1	0.8	NA	0.2	NA	.13	.17	NA	.05
	37	*36*		*36*					
044.	2.4	1.5	0.8	0.6	0.1	.11	.09	.11	.07
	49	*50*	*43*	*45*	*49*				
045.	1.7	0.9	0.8	0.5	-1.8	.14	.15	.11	.07
	42	*39*	*40*	*42*	*31*				
046.	2.4	1.4	1.2	0.9	-0.1	.11	.09	.11	.07
	49	*48*	*58*	*50*	*48*				
047.	1.3	1.1	1.1	0.4	NA	.16	.12	.16	.06
	39	*42*	*52*	*39*					
048.	2.2	1.4	0.9	0.7	-0.3	.11	.10	.13	.07
	47	*47*	*46*	*46*	*45*				
049.	1.3	1.0	0.9	0.5	NA	.14	.13	.12	.06
	38	*40*	*44*	*41*					
050.	1.6	1.0	0.9	0.6	NA	.13	.12	.12	.06
	42	*40*	*44*	*43*					
051.	3.2	1.8	1.5	1.2	0.2	.09	.07	.09	.06
	56	*56*	*69*	*57*	*50*				
052.	2.9	1.8	1.1	1.0	-0.7	.09	.08	.11	.06
	54	*55*	*55*	*53*	*42*				
053.	2.9	1.7	1.0	0.9	0.3	.09	.07	.09	.06
	54	*54*	*48*	*51*	*52*				
054.	3.6	2.2	0.9	1.4	1.8	.08	.06	.10	.05
	61	*63*	*45*	*62*	*66*				
055.	2.7	1.7	0.5	0.8	1.2	.08	.08	.09	.07
	52	*54*	*30*	*48*	*60*				
056.	1.3	0.9	0.8	0.3	NA	.12	.11	.11	.05
	38	*38*	*42*	*37*					
057.	2.1	1.3	1.0	0.5	-0.2	.11	.11	.14	.06
	46	*46*	*48*	*41*	*47*				
058.	2.4	1.5	0.8	0.7	-0.5	.11	.08	.08	.07
	49	*49*	*39*	*46*	*44*				
059.	1.8	1.2	1.1	0.7	-1.0	.10	.10	.13	.06
	43	*44*	*53*	*47*	*39*				
060.	3.5	1.9	1.3	1.3	0.5	.08	.07	.09	.06
	60	*58*	*63*	*60*	*53*				

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TABLE 5.1 Program Measures (Raw and Standardized Values) in English Lang. & Lit.

Prog No.	University - Department/Academic Unit	Program Size (01)	Program Size (02)	Program Size (03)	Characteristics of Program Graduates (04)	Characteristics of Program Graduates (05)	Characteristics of Program Graduates (06)	Characteristics of Program Graduates (07)
061.	North Carolina, University of-Chapel Hill	49	116	84	.19	9.3	.59	.19
	English	*62*	*73*	*55*	*50*	*49*	*52*	*49*
062.	North Dakota, University of-Grand Forks	21	7	18	NA	NA	NA	NA
	English	*43*	*38*	*41*				
063.	Northern Illinois University-De Kalb	22	22	50	.00	9.7	.39	.09
	English	*44*	*43*	*47*	*33*	*47*	*35*	*38*
064.	Northwestern University	27	33	30	.34	6.8	.58	.18
	English	*47*	*46*	*43*	*62*	*65*	*51*	*47*
065.	Notre Dame, University of	21	39	58	.19	8.4	.61	.13
	English	*43*	*48*	*49*	*49*	*54*	*53*	*43*
066.	Ohio State University-Columbus	48	59	75	.23	7.6	.49	.25
	English	*62*	*55*	*53*	*53*	*60*	*44*	*54*
067.	Ohio University-Athens	37	29	53	.08	8.1	.49	.14
	English Language and Literature	*54*	*45*	*48*	*40*	*56*	*43*	*43*
068.	Oklahoma State University-Stillwater	16	22	36	.06	12.0	.77	.24
	*English**	*40*	*43*	*45*	*38*	*32*	*67*	*53*
069.	Oklahoma, University of-Norman	22	17	37	.14	8.5	.50	.10
	English	*44*	*41*	*45*	*45*	*54*	*44*	*40*
070.	Oregon, University of-Eugene	36	52	120	.07	8.1	.51	.14
	English Language and Literature	*53*	*53*	*62*	*39*	*56*	*45*	*44*
071.	Pennsylvania State University	30	48	48	.10	8.6	.61	.15
	English	*49*	*51*	*47*	*41*	*53*	*54*	*44*
072.	Pennsylvania, University of	41	72	86	.23	7.0	.65	.21
	English	*57*	*59*	*55*	*53*	*63*	*57*	*51*
073.	Pittsburgh, University of	27	23	40	.17	9.1	.48	.13
	English	*47*	*43*	*45*	*48*	*50*	*42*	*43*
074.	Princeton University	27	50	45	.39	6.5	.79	.40
	English	*47*	*52*	*46*	*66*	*66*	*69*	*70*
075.	Purdue University-West Lafayette	44	46	152	.03	7.6	.49	.20
	English	*59*	*51*	*69*	*36*	*59*	*43*	*50*
076.	Rhode Island, University of	30	20	25	.00	9.3	.62	.08
	English	*49*	*42*	*42*	*33*	*49*	*54*	*37*
077.	Rice University	17	18	62	.13	5.3	.48	.26
	English	*40*	*42*	*50*	*44*	*73*	*42*	*56*
078.	Rochester, University of	24	33	70	.22	9.6	.67	.30
	English	*45*	*46*	*52*	*52*	*47*	*58*	*60*
079.	Rutgers, The State University-New Brunswick	42	59	171	.20	8.0	.45	.23
	English	*58*	*55*	*73*	*50*	*57*	*40*	*53*
080.	SUNY at Binghamton	25	47	47	.00	8.7	.56	.11
	English, General Literature, and Rhetoric	*46*	*51*	*47*	*33*	*53*	*50*	*41*

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TABLE 5.1 Program Measures (Raw and Standardized Values) in English Lang. & Lit.

Prog No.	Survey Results (08)	(09)	(10)	(11)	University Library (12)	Survey Ratings Standard Error (08)	(09)	(10)	(11)
061.	3.5	2.0	1.1	1.3	1.0	.08	.06	.08	.06
	60	*60*	*54*	*61*	*58*				
062.	0.7	0.5	NA	0.2	NA	.13	.17	NA	.05
	33	*30*		*34*					
063.	1.2	0.9	0.9	0.3	NA	.15	.15	.10	.05
	38	*38*	*45*	*37*					
064.	3.5	2.0	1.2	1.4	0.3	.08	.05	.09	.06
	60	*60*	*57*	*61*	*51*				
065.	1.9	1.3	0.6	0.7	-1.3	.12	.10	.09	.06
	44	*46*	*34*	*47*	*35*				
066.	2.9	1.8	0.8	1.1	0.9	.08	.07	.09	.06
	54	*54*	*42*	*55*	*57*				
067.	1.5	1.0	0.6	0.3	NA	.12	.12	.15	.05
	40	*40*	*33*	*38*					
068.	0.8	0.7	0.9	0.3	-1.9	.12	.12	.15	.06
	34	*35*	*45*	*37*	*29*				
069.	1.9	1.2	1.1	0.6	-0.6	.11	.10	.11	.06
	44	*44*	*52*	*44*	*43*				
070.	2.3	1.4	0.9	0.7	-0.9	.12	.10	.09	.06
	48	*48*	*45*	*46*	*39*				
071.	2.8	1.8	1.1	1.0	0.7	.10	.07	.07	.07
	53	*55*	*52*	*53*	*55*				
072.	4.0	2.2	1.5	1.6	0.7	.07	.06	.08	.06
	64	*63*	*70*	*66*	*55*				
073.	2.0	1.3	0.9	0.7	0.1	.10	.09	.08	.06
	45	*46*	*45*	*45*	*49*				
074.	4.2	2.4	1.0	1.6	0.9	.07	.06	.08	.06
	67	*67*	*50*	*67*	*57*				
075.	2.3	1.4	0.9	0.7	-0.5	.13	.11	.12	.06
	48	*48*	*45*	*45*	*43*				
076.	1.2	0.8	NA	0.3	NA	.11	.12	NA	.05
	38	*36*		*37*					
077.	2.6	1.6	0.8	0.8	-1.4	.10	.09	.10	.06
	51	*51*	*42*	*50*	*34*				
078.	3.0	1.8	1.0	1.1	-0.6	.11	.07	.09	.07
	55	*56*	*48*	*55*	*42*				
079.	3.8	2.1	1.4	1.5	0.8	.07	.05	.07	.06
	62	*60*	*66*	*64*	*56*				
080.	2.6	1.6	1.0	0.9	NA	.11	.09	.15	.06
	51	*51*	*50*	*52*					

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TABLE 5.1 Program Measures (Raw and Standardized Values) in English Lang. & Lit.

Prog No.	University - Department/Academic Unit	•	Program Size (01)	(02)	(03)	Characteristics of Program Graduates (04)	(05)	(06)	(07)
081.	SUNY at Buffalo		59	100	158	.14	7.3	.51	.22
	English		*69*	*68*	*70*	*45*	*61*	*45*	*51*
082.	SUNY at Stony Brook		36	69	132	.06	9.9	.61	.23
	English		*53*	*58*	*64*	*38*	*45*	*53*	*52*
083.	Saint Louis University		14	25	25	.15	10.5	.67	.07
	English		*38*	*44*	*42*	*46*	*41*	*58*	*37*
084.	South Carolina, University of-Columbia		42	79	78	.12	8.3	.54	.14
	English		*58*	*61*	*53*	*44*	*55*	*48*	*44*
085.	Southern California, University of		17	29	89	.30	8.5	.57	.33
	English		*40*	*45*	*56*	*59*	*54*	*50*	*63*
~~086.~~	~~Southern Illinois University-Carbondale~~		~~30~~	~~30~~	~~14~~	~~.21~~	~~9.7~~	~~.48~~	~~.07~~
	English		*49*	*45*	*40*	*51*	*47*	*43*	*37*
087.	Stanford University		37	56	71	.47	7.4	.80	.53
	English		*54*	*54*	*52*	*73*	*61*	*69*	*82*
088.	Syracuse University		33	42	38	.18	10.1	.56	.22
	English		*51*	*49*	*45*	*48*	*44*	*49*	*52*
089.	Temple University		22	41	67	.20	11.1	.59	.13
	English		*44*	*49*	*51*	*50*	*38*	*52*	*42*
090.	Tennessee, University of-Knoxville		26	46	69	.31	8.6	.61	.22
	English		*47*	*51*	*51*	*59*	*53*	*54*	*52*
091.	Texas A & M University		32	18	39	.05	10.7	.47	.21
	English		*51*	*42*	*45*	*37*	*40*	*42*	*51*
092.	Texas Tech University-Lubbock		19	25	21	.06	8.4	.72	.16
	English		*42*	*44*	*41*	*39*	*54*	*63*	*45*
093.	Texas, University of-Austin		76	89	72	.09	9.1	.49	.27
	English		*81*	*65*	*52*	*41*	*50*	*43*	*56*
094.	Tufts University		19	24	29	.22	10.1	.36	.23
	English		*42*	*43*	*43*	*52*	*44*	*33*	*52*
095.	Tulane University		23	29	47	.47	10.1	.59	.31
	English		*45*	*45*	*47*	*73*	*44*	*51*	*61*
096.	Tulsa, University of		9	19	34	.18	10.0	.68	.09
	Modern Letters		*35*	*42*	*44*	*49*	*44*	*60*	*39*
097.	Utah, University of-Salt Lake City		29	27	61	.07	8.0	.64	.20
	English		*49*	*44*	*50*	*40*	*57*	*56*	*50*
098.	Vanderbilt University		26	28	61	.25	9.7	.62	.31
	English		*47*	*45*	*50*	*54*	*47*	*54*	*61*
099.	Virginia, University of		40	95	156	.27	6.7	.62	.26
	English		*56*	*66*	*69*	*56*	*65*	*54*	*55*
100.	Washington State University-Pullman		21	11	22	.08	10.8	.55	.27
	English		*43*	*39*	*42*	*40*	*40*	*48*	*57*

* indicates program was initiated since 1970.

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TABLE 5.1 Program Measures (Raw and Standardized Values) in English Lang. & Lit.

Prog No.	Survey Results				University Library	Survey Ratings Standard Error			
	(08)	(09)	(10)	(11)	(12)	(08)	(09)	(10)	(11)
081.	3.6	1.9	1.0	1.4	0.3	.10	.08	.09	.07
	60	*58*	*49*	*61*	*51*				
082.	3.1	1.9	1.2	1.2	-0.6	.08	.06	.10	.07
	56	*58*	*58*	*58*	*42*				
083.	2.1	1.3	0.8	0.8	NA	.12	.12	.10	.06
	46	*46*	*41*	*48*					
084.	2.9	1.7	1.3	1.0	-0.4	.11	.10	.11	.07
	54	*53*	*61*	*53*	*45*				
085.	3.1	1.7	1.4	1.2	0.4	.09	.09	.11	.07
	55	*54*	*67*	*58*	*52*				
086.	1.7	1.1	0.8	0.7	-0.2	.11	.09	.08	.06
	43	*41*	*42*	*47*	*47*				
087.	4.2	2.5	1.1	1.6	2.0	.08	.07	.07	.06
	66	*68*	*55*	*67*	*68*				
088.	2.3	1.5	0.9	0.8	-0.3	.11	.10	.07	.06
	48	*49*	*43*	*48*	*45*				
089.	2.2	1.3	0.9	0.7	-0.4	.10	.09	.11	.06
	47	*45*	*45*	*47*	*44*				
090.	2.4	1.5	1.2	0.7	-0.4	.12	.10	.09	.06
	49	*49*	*59*	*46*	*44*				
091.	1.6	1.1	1.5	0.4	-0.5	.11	.11	.12	.06
	42	*41*	*72*	*40*	*44*				
092.	0.9	0.7	1.1	0.4	NA	.11	.11	.10	.06
	34	*35*	*52*	*39*					
093.	3.4	2.1	1.3	1.3	1.6	.09	.06	.09	.06
	59	*60*	*63*	*59*	*64*				
094.	2.4	1.6	0.9	0.7	NA	.13	.13	.12	.06
	49	*52*	*44*	*47*					
095.	2.3	1.4	0.7	0.6	-1.0	.12	.09	.12	.06
	48	*48*	*38*	*45*	*38*				
096.	1.2	0.8	1.3	0.7	NA	.13	.12	.12	.06
	38	*37*	*62*	*45*					
097.	1.6	1.1	1.3	0.3	-0.6	.14	.11	.15	.05
	41	*42*	*63*	*37*	*42*				
098.	2.6	1.6	1.1	0.9	-0.7	.09	.08	.10	.07
	51	*52*	*56*	*50*	*41*				
099.	4.6	2.4	1.3	1.8	0.7	.06	.06	.07	.05
	70	*67*	*63*	*71*	*56*				
100.	1.3	0.9	1.0	0.3	-0.3	.14	.16	.12	.05
	39	*39*	*48*	*37*	*46*				

NOTE: On the first line of data for every program, raw values for each measure are reported; on the second line values are reported in standardized form, with mean = 50 and standard deviation = 10. "NA" indicates that the value for a measure is not available.

TABLE 5.1 Program Measures (Raw and Standardized Values) in English Lang. & Lit.

Prog No.	University - Department/Academic Unit	Program Size (01)	(02)	(03)	Characteristics of Program Graduates (04)	(05)	(06)	(07)
101.	Washington University-Saint Louis	23	13	23	.40	8.2	.68	.21
	English and American Literature	*45*	*40*	*42*	*67*	*56*	*60*	*51*
102.	Washington, University of-Seattle	60	135	51	.13	8.2	.50	.24
	English	*70*	*79*	*48*	*44*	*56*	*44*	*53*
103.	Wayne State University	61	25	25	.14	10.6	.25	.00
	English	*71*	*44*	*42*	*45*	*41*	*23*	*30*
104.	Wisconsin, University of-Madison	50	120	126	.20	10.4	.62	.26
	English	*63*	*75*	*63*	*50*	*42*	*54*	*55*
105.	Wisconsin, University of-Milwaukee	31	31	39	.13	9.7	.52	.26
	English	*50*	*46*	*45*	*44*	*47*	*46*	*56*
106.	Yale University	31	106	91	.39	6.0	.72	.48
	English Language and Literature	*50*	*70*	*56*	*66*	*69*	*63*	*77*

* indicates program was initiated since 1970.

NOTE: On the first line of data for every program, raw values for each measure are reported; on the second line values are reported in standardized form, with mean = 50 and standard deviation = 10. "NA" indicates that the value for a measure is not available.

TABLE 5.1 Program Measures (Raw and Standardized Values) in English Lang. & Lit.

Prog No.	Survey Results				University Library	Survey Ratings Standard Error			
	(08)	(09)	(10)	(11)	(12)	(08)	(09)	(10)	(11)
101.	2.6	1.7	0.8	0.8	-0.4	.10	.08	.13	.06
	51	*53*	*42*	*50*	*45*				
102.	3.4	2.0	1.2	1.2	1.5	.07	.06	.10	.05
	58	*59*	*60*	*58*	*63*				
103.	2.0	1.3	0.9	0.6	-0.4	.13	.09	.13	.06
	46	*46*	*44*	*43*	*45*				
104.	3.5	2.1	0.8	1.3	1.6	.08	.06	.09	.06
	60	*61*	*40*	*60*	*64*				
105.	2.7	1.7	1.2	1.0	NA	.11	.09	.11	.06
	52	*53*	*59*	*52*					
106.	4.9	2.7	1.0	1.9	2.1	.03	.05	.07	.04
	73	*71*	*48*	*73*	*69*				

NOTE: On the first line of data for every program, raw values for each measure are reported; on the second line values are reported in standardized form, with mean = 50 and standard deviation = 10. "NA" indicates that the value for a measure is not available.

TABLE 5.2 Summary Statistics Describing Each Program Measure--English Language & Literature

Measure	Number of Programs Evaluated	Mean	Standard Deviation	DECILES 1	2	3	4	5	6	7	8	9
Program Size												
01 Raw Value	106	31	15	16	19	22	25	27	32	36	41	50
Std Value	106	50	10	40	42	44	46	47	51	53	57	63
02 Raw Value	106	44	31	17	19	25	28	33	42	48	61	95
Std Value	106	50	10	41	42	44	45	46	49	51	55	66
03 Raw Value	106	62	48	23	27	33	37	47	59	70	86	126
Std Value	106	50	10	42	43	44	45	47	49	52	55	63
Program Graduates												
04 Raw Value	103	.20	.12	.05	.09	.12	.15	.19	.22	.25	.30	.36
Std Value	103	50	10	38	41	43	46	49	52	54	58	63
05 Raw Value	104	9.1	1.6	11.1	10.5	10.1	9.7	9.1	8.5	8.2	8.0	7.3
Std Value	104	50	10	38	41	44	46	50	54	56	57	61
06 Raw Value	103	.57	.12	.45	.48	.50	.52	.57	.59	.62	.66	.72
Std Value	103	50	10	40	43	44	46	50	52	54	58	63
07 Raw Value	103	.20	.10	.09	.11	.13	.17	.20	.22	.25	.29	.33
Std Value	103	50	10	39	41	43	47	50	52	55	59	63
Survey Results												
08 Raw Value	106	2.5	1.0	1.2	1.5	1.8	2.2	2.4	2.7	3.0	3.5	4.0
Std Value	106	50	10	38	40	43	47	49	52	55	60	65
09 Raw Value	106	1.5	.5	.8	1.0	1.2	1.4	1.5	1.7	1.8	2.0	2.2
Std Value	106	50	10	36	40	44	48	50	53	55	59	63
10 Raw Value	102	1.0	.2	.7	.8	.9	.9	1.0	1.1	1.1	1.2	1.3
Std Value	102	50	10	37	41	45	45	50	54	54	58	63
11 Raw Value	106	.9	.4	.3	.4	.6	.7	.8	.9	1.1	1.3	1.5
Std Value	106	50	10	37	40	44	46	49	51	55	60	65
University Library												
12 Raw Value	75	.2	1.0	-1.0	-.6	-.5	-.4	-.1	.3	.7	.9	1.7
Std Value	75	50	10	39	43	44	45	47	51	55	57	65

NOTE: Standardized values reported in the preceding table have been computed from exact values of the mean and standard deviation and not the rounded values reported here.

TABLE 5.3 Intercorrelations Among Program Measures on 106 Programs in English Language & Literature

	Measure											
	01	02	03	04	05	06	07	08	09	10	11	12
Program Size												
01		.65	.48	-.04	.10	-.16	.11	.50	.50	.31	.48	.51
02			.70	.01	.21	.02	.21	.68	.66	.19	.69	.59
03				.00	.16	-.07	.11	.58	.55	.23	.58	.34
Program Graduates												
04					.09	.17	.35	.38	.40	-.05	.35	.29
05						.09	.50	.47	.44	.09	.48	.27
06							.34	.04	.05	-.08	.08	.16
07								.54	.55	.02	.52	.32
Survey Results												
08									.98	.28	.98	.71
09										.24	.95	.71
10											.31	.18
11												.69
University Library												
12												

NOTE: Since in computing correlation coefficients program data must be available for both of the measures being correlated, the actual number of programs on which each coefficient is based varies.

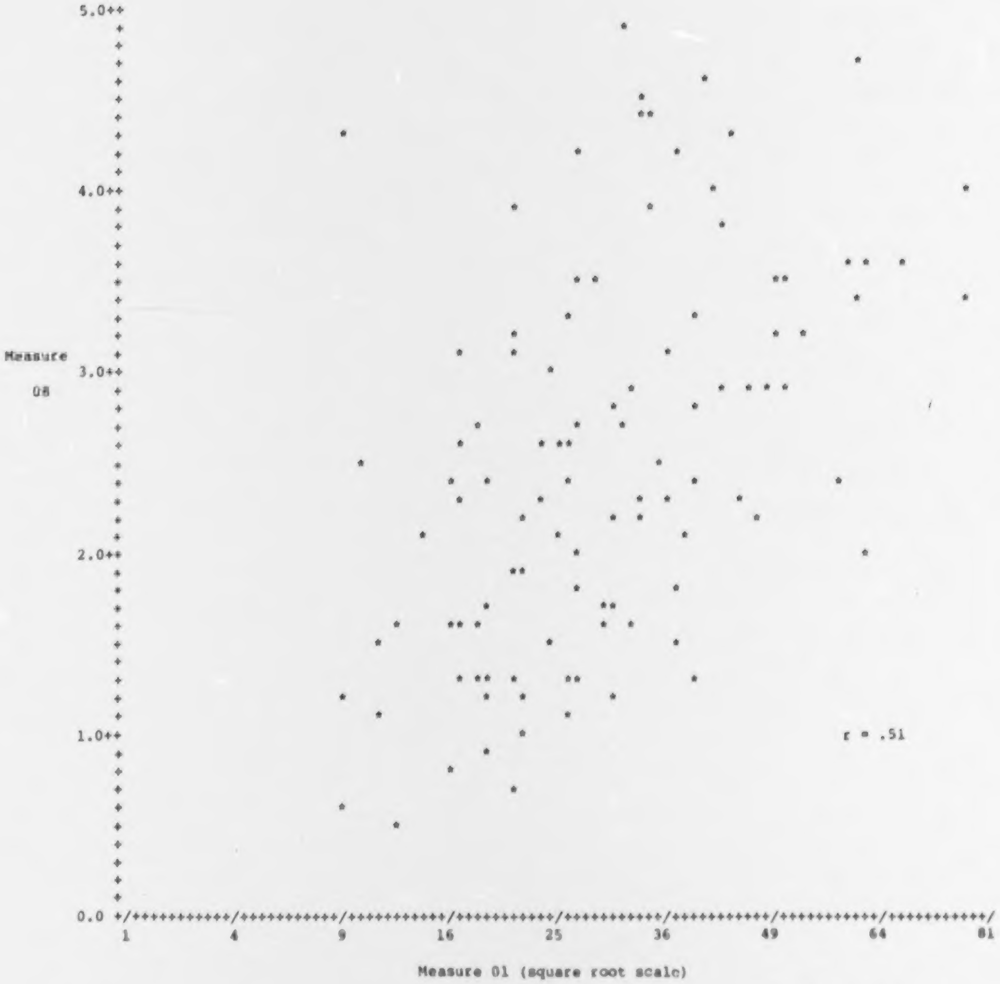

FIGURE 5.1 Mean rating of scholarly quality of faculty (measure 08) versus number of faculty members (measure 01)--106 programs in English language & literature.

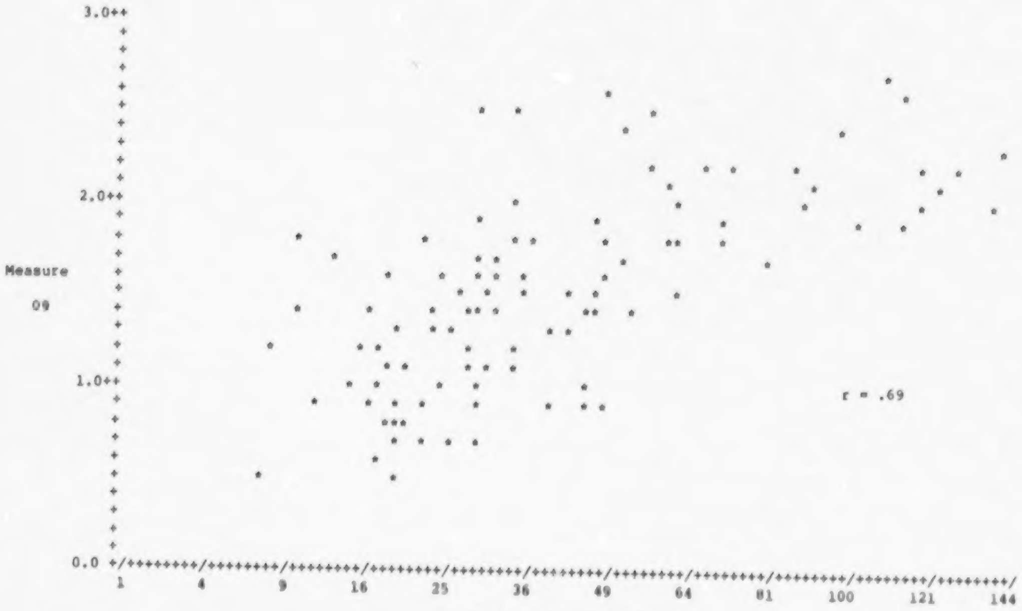

FIGURE 5.2 Mean rating of program effectiveness in educating research scholars/scientists (measure 09) versus number of graduates in last five years (measure 02)--106 programs in English language & literature.

TABLE 5.4 Characteristics of Survey Participants in English Language & Literature

	Respondents	
	N	%
Field of Specialization		
English Language and Literature	177	89
Other/Unknown	21	11
Faculty Rank		
Professor	105	53
Associate Professor	75	38
Assistant Professor	18	9
Year of Highest Degree		
Pre-1950	8	4
1950-59	41	21
1960-69	86	43
Post-1969	60	30
Unknown	3	2
Evaluator Selection		
Nominated by Institution	180	91
Other	18	9
Survey Form		
With Faculty Names	177	89
Without Names	21	11
Total Evaluators	198	100

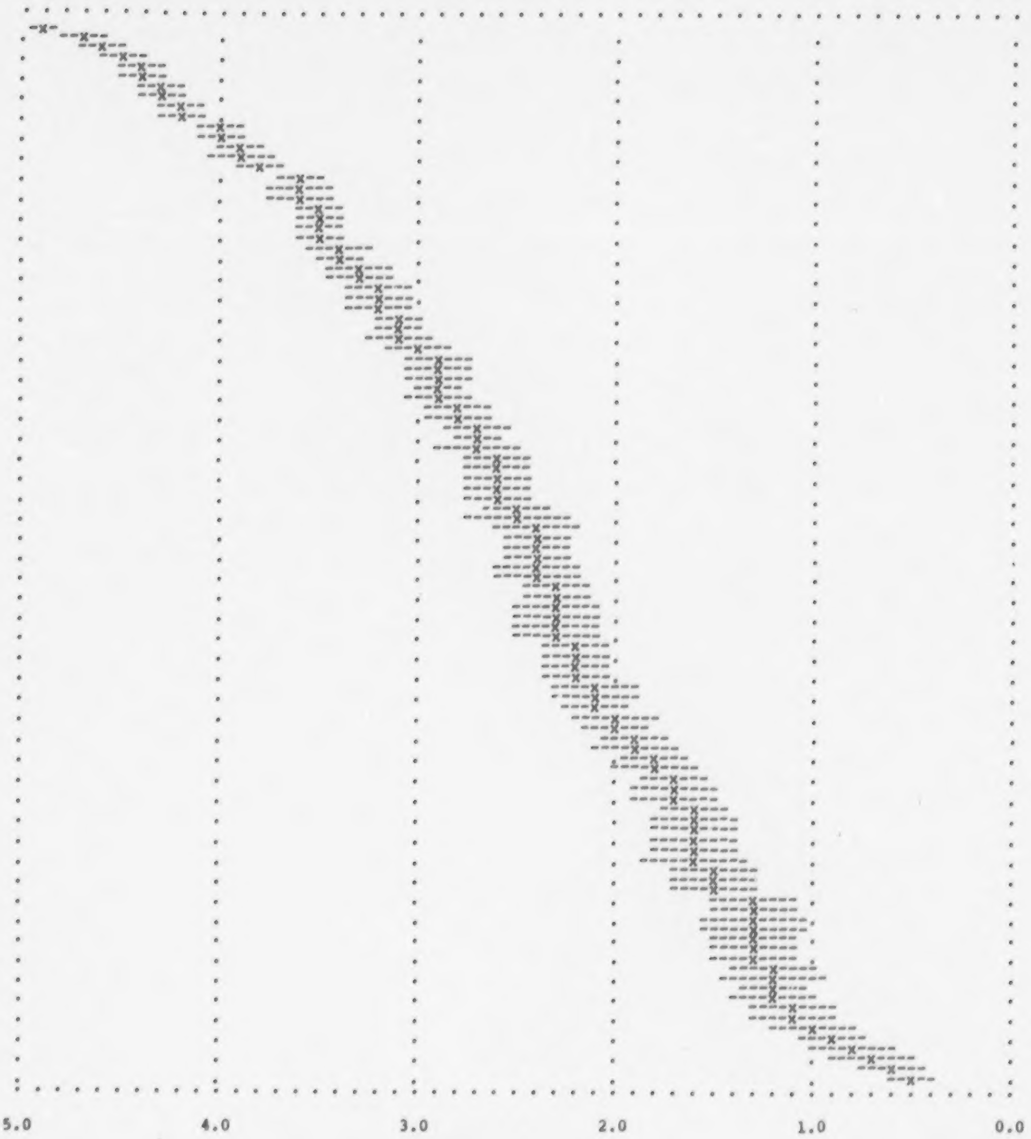

FIGURE 5.3 Mean rating of scholarly quality of faculty in 106 programs in English language & literature.

NOTE: Programs are listed in sequence of mean rating, with the highest-rated program appearing at the top of the page. The broken lines (---) indicate a confidence interval of ±1.5 standard errors around the reported mean (x) of each program.

VI

French Language and Literature Programs

In this chapter 58 research-doctorate programs in French language and literature are assessed. These programs, according to the information supplied by their universities, have accounted for 811 doctoral degrees awarded during the FY1976-80 period--approximately 82 percent of the aggregate number of French language and literature doctorates earned from U.S. universities in this five-year span.[1] With respect to this percentage it should be pointed out that five of the university coordinators providing program information to the committee were unable to determine how many of the recent graduates from the departments of romance languages or modern languages were degree recipients in French. Data for these five programs are not included in the above estimate. On the average, 20 full-time and part-time students intending to earn doctorates were enrolled in a program in December 1980, with an average faculty size of 11 members.[2] Most of the 58 programs, listed in Table 6.1, are located in departments of French and Italian or romance languages. Eleven are found in departments of French (only) and eight in modern languages. Only one of the programs was initiated since 1970, and no two programs are located in the same university. In addition to the 58 institutions represented in this discipline, another 4 were initially identified as meeting the criteria[3] for inclusion in the assessment:

Georgetown University
Middlebury College
SUNY at Binghamton
University of Rochester

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[1] Data from the NRC's Survey of Earned Doctorates indicate that 985 research doctorates in French language and literature were awarded by U.S. universities between FY1976 and FY1980.

[2] See the reported means for measures 03 and 01 in Table 6.2.

[3] As mentioned in Chapter I, the primary criterion for inclusion was that a university had awarded at least 5 doctorates in French during the FY1976-78 period.

French programs at these four institutions have not been included in the evaluations in this discipline, since in each case the study coordinator either indicated that the institution did not at that time have a research-doctorate program in French or failed to provide the information requested by the committee.

Before examining individual program results presented in Table 6.1, the reader is urged to refer to Chapter II, in which each of the 12 measures used in the assessment is discussed. Summary statistics describing every measure are given in Table 6.2. For eight of the measures, data are reported for at least 52 of the 58 French programs. For measures 04-07, which pertain to characteristics of the program graduates, data are presented for only approximately two-thirds of the programs; the other third had too few graduates on which to base statistics.[4]

Intercorrelations among the 12 measures (Pearson product-moment coefficients) are given in Table 6.3. Of particular note are the high positive correlations of the measures of program size (01-03) and library index (12) with reputational survey ratings (08, 09). Figure 6.1 illustrates the relation between the mean rating of the scholarly quality of faculty (measure 08) and the number of faculty members (measure 01) for each of 58 programs in French. Figure 6.2 plots the mean rating of program effectiveness (measure 09) against the total number of FY1976-80 program graduates (measure 02). Although in both figures there is a significant positive correlation between program size and reputational rating, it is quite apparent that some of the smaller programs received high mean ratings and that some of the larger programs received low mean ratings.

Table 6.4 describes the 110 faculty members who participated in the evaluation of French programs. These individuals constituted 63 percent of those asked to respond to the survey in this discipline and 18 percent of the faculty population in the 58 research-doctorate programs being evaluated.[5] Approximately one-third of the survey participants had earned their highest degree since 1970, and a majority held the rank of full professor.

One exception should be noted with regard to the survey evaluations in this discipline. It has been called to the attention of the committee that the faculty list (used in the survey) for the Department of Romance Languages and Literatures at Harvard University was missing the name of one member. The committee has decided to report the survey results for this program but cautions that the reputational ratings may have been influenced by this omission.

To assist the reader in interpreting results of the survey evaluations, estimated standard errors have been computed for mean ratings of the scholarly quality of faculty in 58 French programs (and are given in Table 6.1). For each program the mean rating and an associated "confidence interval" of 1.5 standard errors are illustrated in Figure 6.3 (listed in order of highest to lowest mean rating). In comparing two programs, if their confidence intervals do not overlap, one may conclude that there is a significant difference in their mean ratings at a .05 level of significance.[6] From this figure it is also apparent that one should have somewhat more confidence in the accuracy of the mean ratings of higher-rated programs than lower-rated programs. This generalization results primarily from the fact that evaluators are not as likely to be familiar with the less prestigious programs, and consequently the mean ratings of these programs are usually based on fewer survey responses.

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[4] As mentioned in Chapter II, data for measures 04-07 are not reported if they are based on the survey responses of fewer than 10 FY1975-79 program graduates.

[5] See Table 2.3 in Chapter II.

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[6] See pp. 28-30 for a discussion of the interpretation of mean ratings and associated confidence intervals.

TABLE 6.1 Program Measures (Raw and Standardized Values) in French Lang. & Lit.

Prog No.	University - Department/Academic Unit	Program Size (01)	(02)	(03)	Characteristics of Program Graduates (04)	(05)	(06)	(07)
001.	Arizona, University of-Tucson	7	9	6	.64	11.5	.50	.10
	Romance Languages	*41*	*44*	*41*	*78*	*34*	*51*	*41*
002.	Boston College	13	10	31	NA	NA	.73	.18
	Romance Languages and Literature	*56*	*45*	*57*			*69*	*49*
003.	Boston University	7	5	NA	NA	NA	NA	NA
	Modern Foreign Languages and Literature	*41*	*41*					
004.	Brown University	10	23	12	.38	8.1	.48	.09
	French Studies	*49*	*57*	*45*	*59*	*57*	*50*	*40*
005.	Bryn Mawr College	7	7	18	NA	NA	NA	NA
	French	*41*	*43*	*49*				
006.	CUNY-Graduate School	11	52	40	.09	10.0	.25	.06
	French	*51*	*83*	*63*	*38*	*44*	*31*	*37*
007.	California, University of-Berkeley	13	23	28	.31	7.2	.47	.33
	French	*56*	*57*	*55*	*54*	*63*	*49*	*64*
008.	California, University of-Davis	8	6	10	NA	NA	NA	NA
	French and Italian	*43*	*42*	*44*				
009.	California, University of-Irvine	10	12	13	.27	8.7	.46	.18
	French and Italian	*49*	*47*	*46*	*51*	*53*	*48*	*49*
010.	California, University of-Los Angeles	10	28	36	.05	8.8	.40	.15
	French	*49*	*61*	*60*	*35*	*53*	*44*	*46*
011.	California, University of-Santa Barbara	12	8	4	NA	NA	NA	NA
	French and Italian	*54*	*43*	*40*				
012.	Case Western Reserve University	3	12	6	.12	11.0	.29	.12
	Modern Languages and Literatures	*31*	*47*	*41*	*40*	*38*	*35*	*43*
013.	Catholic University of America	6	5	16	NA	NA	NA	NA
	Modern Languages	*38*	*41*	*48*				
014.	Chicago, University of	8	11	36	NA	NA	NA	NA
	Romance Languages and Literatures	*43*	*46*	*60*				
015.	Colorado, University of	9	6	15	NA	NA	NA	NA
	French and Italian	*46*	*42*	*47*				
016.	Columbia University	17	39	76	.25	11.5	.51	.16
	French and Romance Philology	*66*	*71*	*85*	*50*	*34*	*52*	*47*
017.	Connecticut, University of-Storrs	10	14	10	.33	8.5	.67	.08
	Romance and Classical Languages	*49*	*49*	*44*	*56*	*55*	*65*	*40*
018.	Cornell University-Ithaca	14	NA	NA	.29	6.3	.67	.37
	Romance Studies	*59*			*53*	*70*	*65*	*67*
019.	Duke University	9	13	9	.46	7.6	.42	.00
	Romance Languages	*46*	*48*	*43*	*65*	*61*	*45*	*31*
020.	Emory University	5	5	10	NA	NA	NA	NA
	Modern Languages and Classics	*36*	*41*	*44*				

* indicates program was initiated since 1970.

NOTE: On the first line of data for every program, raw values for each measure are reported; on the second line values are reported in standardized form, with mean = 50 and standard deviation = 10. "NA" indicates that the value for a measure is not available.

TABLE 6.1 Program Measures (Raw and Standardized Values) in French Lang. & Lit.

Prog No.	Survey Results				University Library	Survey Ratings Standard Error			
	(08)	(09)	(10)	(11)	(12)	(08)	(09)	(10)	(11)
001.	1.6	1.1	1.1	0.6	0.9	.11	.10	.10	.06
	39	*40*	*52*	*38*	*54*				
002.	1.7	1.1	1.0	0.6	NA	.14	.12	.09	.07
	40	*40*	*48*	*38*					
003.	1.3	0.7	1.0	0.5	-0.4	.13	.11	.13	.07
	36	*31*	*50*	*36*	*42*				
004.	2.7	1.9	1.1	1.0	-1.1	.10	.06	.10	.06
	51	*57*	*54*	*50*	*35*				
005.	2.6	1.7	0.8	0.9	NA	.12	.08	.07	.07
	49	*52*	*42*	*48*					
006.	3.7	2.1	1.1	1.4	NA	.10	.08	.07	.07
	62	*60*	*55*	*60*					
007.	3.6	2.0	1.2	1.5	2.2	.08	.06	.08	.06
	61	*59*	*59*	*62*	*67*				
008.	2.9	1.6	1.3	1.0	0.6	.10	.08	.09	.07
	53	*51*	*61*	*49*	*52*				
009.	3.2	1.9	1.3	1.3	NA	.10	.07	.07	.07
	56	*55*	*62*	*58*					
010.	2.4	1.6	0.7	1.0	2.0	.10	.08	.09	.07
	48	*50*	*36*	*49*	*65*				
011.	2.9	1.7	1.2	1.2	-0.1	.10	.08	.07	.07
	53	*53*	*56*	*55*	*44*				
012.	1.0	0.8	0.3	0.6	-1.3	.15	.11	.08	.07
	33	*34*	*23*	*38*	*33*				
013.	1.2	1.0	0.7	0.4	NA	.12	.11	.09	.06
	34	*37*	*38*	*34*					
014.	3.1	1.9	0.8	1.1	0.9	.10	.07	.10	.07
	56	*56*	*43*	*53*	*54*				
015.	1.5	1.1	0.8	0.6	-0.9	.13	.10	.08	.06
	38	*40*	*41*	*38*	*37*				
016.	4.4	2.3	1.0	1.8	1.7	.07	.06	.07	.04
	70	*65*	*51*	*71*	*62*				
017.	1.7	1.2	1.1	0.6	-0.5	.12	.09	.08	.06
	40	*42*	*54*	*38*	*41*				
018.	3.6	2.2	1.0	1.3	1.6	.08	.06	.08	.07
	60	*63*	*51*	*59*	*61*				
019.	3.2	1.9	1.2	1.3	0.3	.08	.05	.09	.06
	56	*57*	*57*	*56*	*49*				
020.	1.1	0.7	0.6	0.6	-0.6	.12	.11	.12	.07
	33	*32*	*33*	*38*	*40*				

NOTE: On the first line of data for every program, raw values for each measure are reported; on the second line values are reported in standardized form, with mean = 50 and standard deviation = 10. "NA" indicates that the value for a measure is not available.

TABLE 6.1 Program Measures (Raw and Standardized Values) in French Lang. & Lit.

Prog No.	University - Department/Academic Unit	Program Size			Characteristics of Program Graduates			
		(01)	(02)	(03)	(04)	(05)	(06)	(07)
021.	Florida State University-Tallahassee	9	10	18	.09	6.8	.46	.00
	Modern Languages	*46*	*45*	*49*	*38*	*66*	*48*	*31*
022.	Fordham University	5	14	15	.29	11.5	.57	.07
	Modern Languages and Literatures	*36*	*49*	*47*	*52*	*34*	*57*	*38*
023.	Harvard University	9	NA	21	.13	9.0	.50	.18
	Romance Languages and Literatures	*46*		*51*	*40*	*51*	*51*	*49*
024.	Illinois, University-Urbana/Champaign	19	20	20	.18	7.6	.52	.26
	French	*71*	*54*	*50*	*44*	*61*	*53*	*57*
025.	Indiana University-Bloomington	15	26	42	.14	9.2	.54	.29
	French and Italian	*61*	*60*	*64*	*42*	*50*	*54*	*59*
026.	Iowa, University of-Iowa City	13	12	14	.30	8.5	.40	.30
	French and Italian	*56*	*47*	*46*	*53*	*55*	*44*	*61*
027.	Johns Hopkins University	3	17	13	.20	7.1	.47	.27
	Romance Languages	*31*	*52*	*46*	*46*	*64*	*49*	*57*
028.	Kansas, University of	11	13	10	.47	11.3	.77	.24
	French and Italian	*51*	*48*	*44*	*66*	*36*	*72*	*54*
029.	Kentucky, University of	8	9	1	.30	11.5	NA	NA
	French Language and Literature	*43*	*44*	*38*	*53*	*34*		
030.	Maryland, University of-College Park	13	7	14	NA	NA	NA	NA
	French and Italian Languages and Literature	*56*	*43*	*46*				
031.	Massachusetts, University of-Amherst	16	16	11	.18	9.5	.46	.27
	French and Italian	*64*	*51*	*45*	*45*	*48*	*48*	*58*
032.	Michigan State University-East Lansing	10	7	19	NA	NA	NA	NA
	Romance & Classical Languages & Literatures	*49*	*43*	*50*				
033.	Michigan, University of-Ann Arbor	16	14	15	.06	10.5	.28	.22
	Romance Languages and Literatures	*64*	*49*	*47*	*35*	*41*	*34*	*53*
034.	Minnesota, University of	8	11	13	.18	9.5	.18	.18
	French and Italian	*43*	*46*	*46*	*45*	*48*	*26*	*49*
035.	Missouri, University of-Columbia	9	8	10	NA	NA	NA	NA
	Romance Language	*46*	*43*	*44*				
036.	Nebraska, University of-Lincoln	6	1	4	NA	NA	NA	NA
	Modern Languages and Literatures	*38*	*37*	*40*				
037.	New York University	19	18	41	.09	10.0	.50	.20
	French and Italian Languages & Literatures	*71*	*52*	*63*	*38*	*44*	*51*	*51*
038.	North Carolina, University of-Chapel Hill	8	28	39	.23	9.1	.64	.32
	Romance Languages	*43*	*61*	*62*	*48*	*51*	*62*	*62*
039.	Northwestern University	12	15	11	.29	10.5	.44	.13
	French and Italian	*54*	*50*	*45*	*53*	*41*	*47*	*44*
040.	Ohio State University-Columbus	10	NA	NA	.16	10.0	.44	.17
	Romance Languages and Literatures	*49*			*43*	*44*	*47*	*48*

* indicates program was initiated since 1970.

NOTE: On the first line of data for every program, raw values for each measure are reported; on the second line values are reported in standardized form, with mean = 50 and standard deviation = 10. "NA" indicates that the value for a measure is not available.

TABLE 6.1 Program Measures (Raw and Standardized Values) in French Lang. & Lit.

Prog No.	Survey Results (08)	Survey Results (09)	Survey Results (10)	Survey Results (11)	University Library (12)	Survey Ratings Standard Error (08)	Survey Ratings Standard Error (09)	Survey Ratings Standard Error (10)	Survey Ratings Standard Error (11)
021.	1.0	0.7	0.9	0.3	-0.4	.11	.11	.06	.06
	32	*31*	*46*	*32*	*41*				
022.	1.9	1.3	0.8	0.8	NA	.14	.10	.08	.07
	42	*43*	*41*	*44*					
023.	3.2	1.6	1.0	1.6	3.0	.09	.07	.09	.05
	56	*51*	*50*	*64*	*75*				
024.	3.5	2.0	1.2	1.3	2.0	.08	.05	.06	.06
	60	*59*	*57*	*57*	*65*				
025.	3.5	2.2	1.1	1.4	0.9	.11	.07	.06	.07
	60	*63*	*53*	*59*	*55*				
026.	2.3	1.4	1.3	0.7	0.3	.09	.08	.11	.07
	46	*46*	*60*	*42*	*48*				
027.	2.5	1.7	0.2	1.4	-0.4	.19	.11	.05	.07
	49	*51*	*16*	*61*	*42*				
028.	2.3	1.5	0.9	0.8	0.1	.10	.08	.07	.08
	46	*48*	*44*	*45*	*46*				
029.	2.5	1.5	0.9	1.2	-0.1	.10	.07	.06	.07
	49	*48*	*44*	*54*	*45*				
030.	1.9	1.1	1.2	0.7	0.2	.11	.09	.09	.07
	43	*41*	*56*	*42*	*47*				
031.	2.4	1.5	1.2	0.9	-0.7	.12	.08	.08	.07
	47	*47*	*56*	*47*	*39*				
032.	2.2	1.3	0.9	0.9	0.3	.11	.10	.07	.07
	46	*45*	*46*	*48*	*49*				
033.	3.6	2.1	1.0	1.5	1.8	.08	.06	.07	.07
	61	*60*	*50*	*61*	*63*				
034.	2.3	1.5	1.2	0.8	1.2	.11	.08	.10	.08
	47	*48*	*56*	*44*	*57*				
035.	1.5	1.0	1.2	0.5	-0.2	.12	.12	.09	.06
	38	*37*	*56*	*37*	*44*				
036.	1.0	0.6	1.1	0.6	-0.5	.11	.10	.14	.07
	32	*29*	*53*	*38*	*41*				
037.	4.3	2.4	1.3	1.7	0.5	.08	.07	.07	.06
	68	*66*	*64*	*67*	*50*				
038.	2.9	1.9	0.8	1.3	1.0	.10	.07	.07	.06
	54	*57*	*41*	*56*	*55*				
039.	2.4	1.5	0.8	0.8	0.3	.10	.08	.08	.06
	47	*48*	*43*	*45*	*48*				
040.	2.6	1.6	0.9	1.0	0.9	.10	.08	.08	.06
	50	*50*	*44*	*50*	*54*				

NOTE: On the first line of data for every program, raw values for each measure are reported; on the second line values are reported in standardized form, with mean = 50 and standard deviation = 10. "NA" indicates that the value for a measure is not available.

TABLE 6.1 Program Measures (Raw and Standardized Values) in French Lang. & Lit.

Prog No.	University - Department/Academic Unit	Program Size			Characteristics of Program Graduates			
		(01)	(02)	(03)	(04)	(05)	(06)	(07)
041.	Oregon, University of-Eugene	7	8	11	NA	NA	NA	NA
	Romance Languages	*41*	*43*	*45*				
042.	Pennsylvania State University	12	20	6	.14	10.0	.60	.05
	French	*54*	*54*	*41*	*42*	*44*	*59*	*36*
043.	Pennsylvania, University of	9	NA	NA	.07	10.1	.67	.29
	Romance Languages	*46*			*37*	*44*	*65*	*60*
044.	Pittsburgh, University of	11	8	4	NA	NA	NA	NA
	French and Italian Languages & Literatures	*51*	*43*	*40*				
045.	Princeton University	11	23	26	.36	6.8	.47	.32
	Romance Languages and Literatures	*51*	*57*	*54*	*58*	*66*	*49*	*62*
046.	Rice University	6	16	15	.31	10.5	.64	.36
	French and Italian	*38*	*51*	*47*	*54*	*41*	*62*	*67*
047.	Rutgers, The State University-New Brunswick	15	6	54	NA	NA	NA	NA
	French	*61*	*42*	*71*				
048.	SUNY at Buffalo	10	11	7	.13	7.0	.47	.27
	Modern Languages and Literatures	*49*	*46*	*42*	*41*	*65*	*49*	*57*
049.	Southern California, University of	7	4	10	NA	NA	NA	NA
	French and Italian	*41*	*40*	*44*				
050.	Stanford University	12	14	18	.46	8.0	.50	.08
	French and Italian	*54*	*49*	*49*	*65*	*58*	*51*	*40*
051.	Texas, University of-Austin	19	12	26	.27	9.0	.50	.30
	French and Italian	*71*	*47*	*54*	*51*	*51*	*51*	*61*
052.	Tulane University	7	11	7	.50	8.4	.30	.10
	French and Italian	*41*	*46*	*42*	*68*	*55*	*36*	*41*
053.	Vanderbilt University	11	18	6	.40	11.0	.33	.07
	French and Italian	*51*	*52*	*41*	*61*	*38*	*38*	*38*
054.	Virginia, University of	13	17	30	.29	9.5	.39	.15
	French Language and Literature	*56*	*52*	*56*	*52*	*48*	*42*	*46*
055.	Washington University-Saint Louis	6	9	6	NA	NA	NA	NA
	Romance Languages	*38*	*44*	*41*				
056.	Washington, University of-Seattle	19	NA	NA	.10	9.5	.50	.30
	Romance Language and Literature	*71*			*39*	*48*	*51*	*61*
057.	Wisconsin, University of-Madison	14	52	39	.36	8.9	.38	.11
	French and Italian	*59*	*83*	*62*	*57*	*52*	*42*	*42*
058.	Yale University	16	48	71	.34	7.7	.53	.33
	French	*64*	*79*	*82*	*56*	*60*	*54*	*64*

* indicates program was initiated since 1970.

NOTE: On the first line of data for every program, raw values for each measure are reported; on the second line values are reported in standardized form, with mean = 50 and standard deviation = 10. "NA" indicates that the value for a measure is not available.

TABLE 6.1 Program Measures (Raw and Standardized Values) in French Lang. & Lit.

Prog No.	Survey Results				University Library	Survey Ratings Standard Error			
	(08)	(09)	(10)	(11)	(12)	(08)	(09)	(10)	(11)
041.	2.1	1.2	1.1	0.7	-0.9	.11	.10	.10	.07
	44	*42*	*54*	*42*	*36*				
042.	2.6	1.7	1.1	1.1	0.7	.08	.07	.07	.07
	50	*53*	*55*	*51*	*52*				
043.	3.7	2.1	1.2	1.5	0.7	.08	.06	.06	.06
	61	*60*	*57*	*63*	*52*				
044.	2.5	1.4	1.0	1.0	0.1	.10	.10	.06	.07
	48	*46*	*50*	*48*	*46*				
045.	4.7	2.6	1.5	1.8	0.9	.05	.05	.05	.04
	73	*71*	*71*	*72*	*54*				
046.	2.5	1.7	1.1	1.0	-1.4	.12	.08	.07	.08
	48	*51*	*55*	*50*	*31*				
047.	2.6	1.5	1.4	1.0	0.8	.10	.09	.08	.07
	50	*48*	*66*	*51*	*53*				
048.	2.9	1.7	0.8	1.1	0.3	.09	.07	.08	.06
	53	*52*	*41*	*51*	*48*				
049.	1.6	0.9	0.9	0.8	0.4	.11	.11	.09	.08
	39	*35*	*47*	*44*	*49*				
050.	3.5	2.1	1.2	1.3	2.0	.10	.06	.09	.07
	59	*61*	*58*	*57*	*65*				
051.	2.9	1.8	1.0	1.0	1.6	.09	.08	.08	.06
	53	*55*	*50*	*50*	*61*				
052.	2.1	1.4	1.0	0.6	-1.0	.11	.11	.06	.07
	44	*46*	*51*	*39*	*35*				
053.	2.7	1.6	1.0	0.8	-0.7	.11	.08	.07	.07
	51	*51*	*48*	*44*	*38*				
054.	3.7	2.0	1.5	1.5	0.7	.08	.05	.07	.06
	62	*59*	*72*	*63*	*53*				
055.	2.3	1.5	0.8	0.7	-0.4	.12	.09	.09	.07
	47	*49*	*41*	*43*	*42*				
056.	2.3	1.6	1.1	0.7	1.5	.12	.11	.07	.07
	47	*50*	*53*	*41*	*60*				
057.	3.2	2.0	0.7	1.3	1.6	.09	.06	.07	.06
	56	*59*	*36*	*56*	*61*				
058.	4.8	2.7	1.1	1.9	2.1	.06	.04	.08	.03
	74	*74*	*53*	*73*	*66*				

NOTE: On the first line of data for every program, raw values for each measure are reported; on the second line values are reported in standardized form, with mean = 50 and standard deviation = 10. "NA" indicates that the value for a measure is not available.

TABLE 6.2 Summary Statistics Describing Each Program Measure--French Language & Literature

Measure	Number of Programs Evaluated	Mean	Standard Deviation	DECILES 1	2	3	4	5	6	7	8	9
Program Size												
01 Raw Value	58	11	4	6	7	8	9	10	11	12	13	16
Std Value	58	50	10	38	41	43	46	49	51	54	56	64
02 Raw Value	53	15	11	5	7	9	11	12	14	16	20	27
Std Value	53	50	10	41	43	44	46	47	49	51	54	60
03 Raw Value	53	20	16	6	7	10	11	14	16	20	30	40
Std Value	53	50	10	41	42	44	45	46	48	50	56	63
Program Graduates												
04 Raw Value	40	.26	.14	.09	.12	.14	.18	.27	.29	.31	.36	.46
Std Value	40	50	10	38	40	41	44	51	52	54	57	64
05 Raw Value	40	9.2	1.5	11.5	10.5	10.0	9.5	9.2	8.9	8.5	7.7	7.1
Std Value	40	50	10	34	41	44	48	50	52	55	60	64
06 Raw Value	40	.48	.13	.29	.39	.44	.46	.47	.50	.51	.57	.67
Std Value	40	50	10	35	43	47	48	49	52	52	57	65
07 Raw Value	40	.19	.10	.06	.08	.11	.15	.18	.22	.27	.30	.32
Std Value	40	50	10	37	39	42	46	49	53	58	61	63
Survey Results												
08 Raw Value	58	2.6	.9	1.3	1.7	2.2	2.4	2.5	2.7	3.1	3.5	3.7
Std Value	58	50	10	36	40	45	48	49	51	55	60	62
09 Raw Value	58	1.6	.5	.9	1.1	1.4	1.5	1.6	1.7	1.9	2.0	2.1
Std Value	58	50	10	36	40	46	48	50	52	56	59	61
10 Raw Value	58	1.0	.2	.7	.8	.9	1.0	1.0	1.1	1.1	1.2	1.3
Std Value	58	50	10	37	41	45	50	50	54	54	58	62
11 Raw Value	58	1.0	.4	.6	.6	.8	.9	1.0	1.1	1.3	1.3	1.5
Std Value	58	50	10	39	39	44	47	50	52	58	58	63
University Library												
12 Raw Value	52	.5	1.0	-.9	-.5	-.4	.2	.3	.7	.9	1.5	1.9
Std Value	52	50	10	37	41	41	47	48	52	54	60	64

NOTE: Standardized values reported in the preceding table have been computed from exact values of the mean and standard deviation and not the rounded values reported here.

TABLE 6.3 Intercorrelations Among Program Measures on 58 Programs in French Language & Literature

								Measure				
	01	02	03	04	05	06	07	08	09	10	11	12
Program Size												
01		.40	.52	-.18	.10	.09	.31	.57	.56	.49	.43	.55
02			.67	-.14	.06	-.11	.07	.64	.67	.02	.63	.51
03				-.20	.06	.10	.28	.60	.58	.16	.59	.55
Program Graduates												
04					-.01	.14	-.18	-.06	-.02	.16	-.15	-.17
05						.03	.23	.22	.26	.12	.20	.18
06							.33	.00	.04	.04	.04	.05
07								.38	.41	.11	.38	.25
Survey Results												
08									.97	.45	.94	.62
09										.37	.90	.58
10											.31	.22
11												.61
University Library												
12												

NOTE: Since in computing correlation coefficients program data must be available for both of the measures being correlated, the actual number of programs on which each coefficient is based varies.

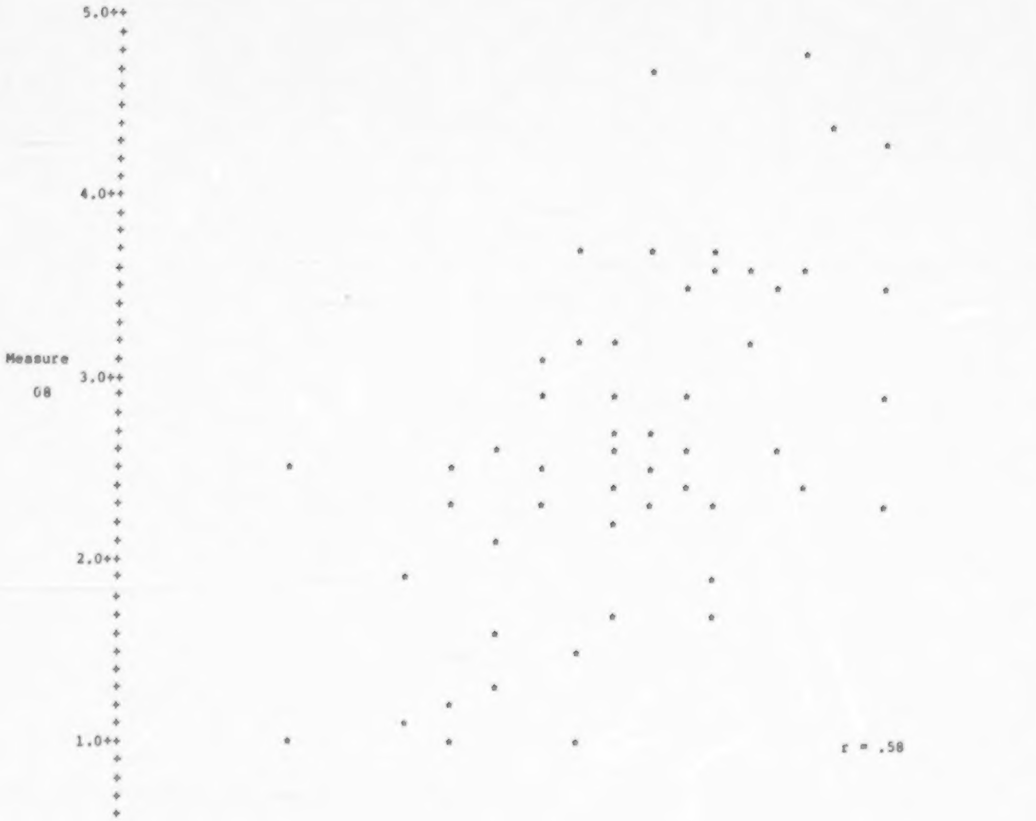

FIGURE 6.1 Mean rating of scholarly quality of faculty (measure 08) versus number of faculty members (measure 01)--58 programs in French language & literature.

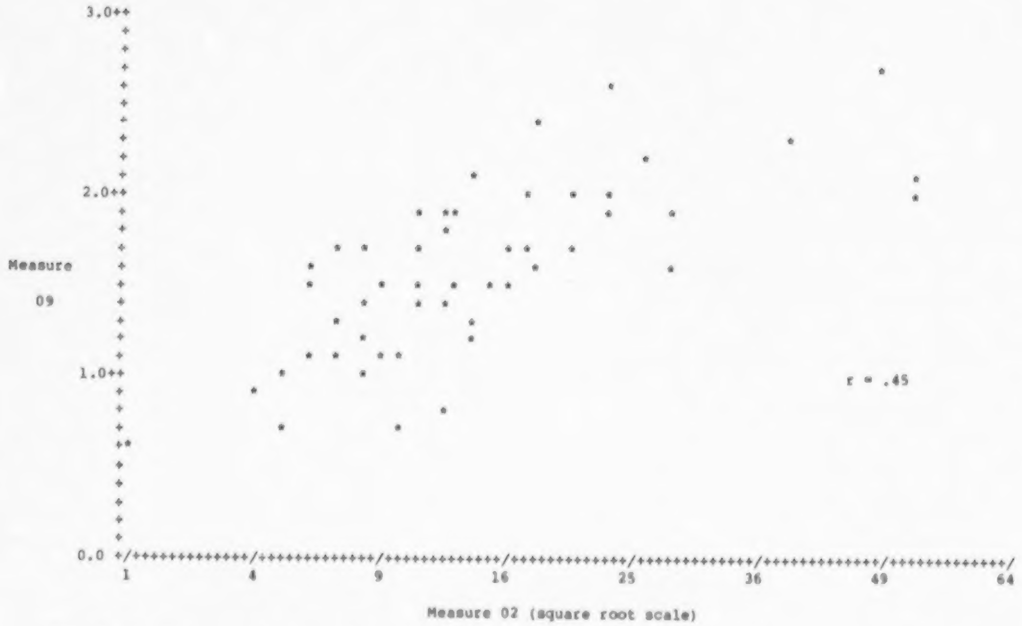

FIGURE 6.2 Mean rating of program effectiveness in educating research scholars/scientists (measure 09) versus number of graduates in last five years (measure 02)--53 programs in French language & literature.

TABLE 6.4 Characteristics of Survey Participants in French Language & Literature

	Respondents	
	N	%
Field of Specialization		
French Language and Literature	100	91
Other/Unknown	10	9
Faculty Rank		
Professor	59	54
Associate Professor	37	34
Assistant Professor	14	13
Year of Highest Degree		
Pre-1950	5	5
1950-59	25	23
1960-69	43	39
Post-1969	36	33
Unknown	1	1
Evaluator Selection		
Nominated by Institution	96	87
Other	14	13
Survey Form		
With Faculty Names	102	93
Without Names	8	7
Total Evaluators	110	100

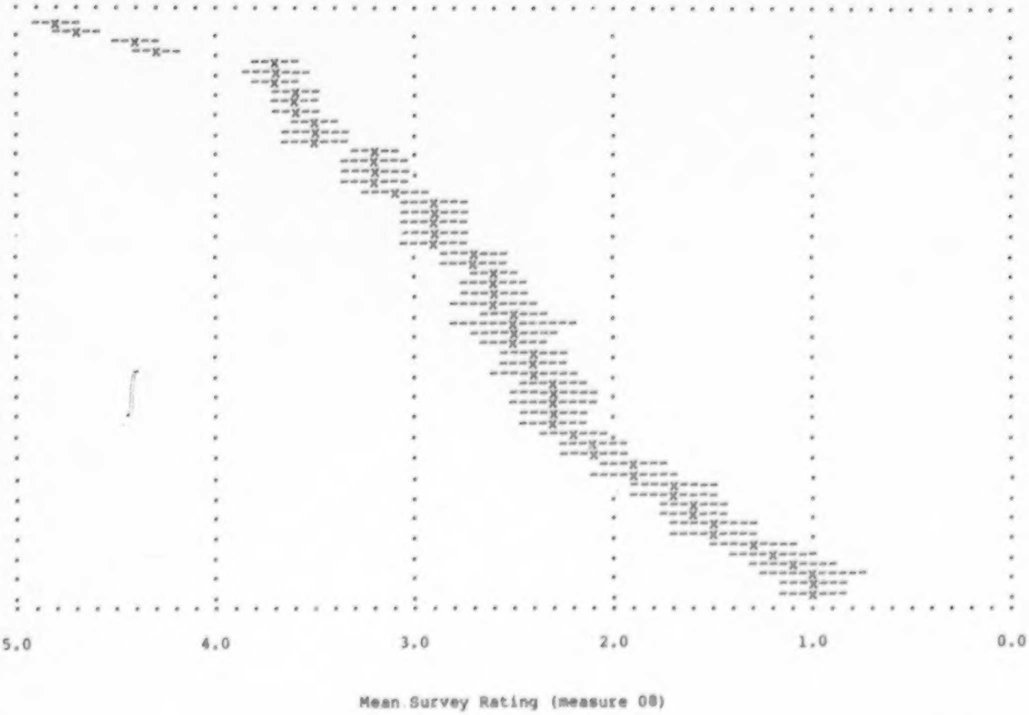

FIGURE 6.3 Mean rating of scholarly quality of faculty in 58 programs in French language & literature.

NOTE: Programs are listed in sequence of mean rating, with the highest-rated program appearing at the top of the page. The broken lines (---) indicate a confidence interval of ±1.5 standard errors around the reported mean (x) of each program.

VII

German Language and Literature Programs

In this chapter 48 research-doctorate programs in German language and literature are assessed. These programs, according to the information supplied by their universities, have accounted for 616 doctoral degrees awarded during the FY1976-80 period--approximately 97 percent of the aggregate number of German language and literature doctorates earned from U.S. universities in this five-year span.[1] On the average, 15 full-time and part-time students intending to earn doctorates were enrolled in a program in December 1980, with an average faculty size of 9 members.[2] Only three of the programs were initiated since 1970, and no two programs are located in the same university. In addition to the 48 institutions represented in this discipline, another 5 were initially identified as meeting the criteria[3] for inclusion in the assessment:

Boston College
University of California--Riverside
Columbia University
University of Kentucky
Syracuse University

German programs at these five institutions have not been included in the evaluations in this discipline, since in each case the study coordinator either indicated that the institution did not at that time have a research-doctorate program in German or failed to provide the information requested by the committee.

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[1] Data from the NRC's Survey of Earned Doctorates indicate that 636 research doctorates in German language and literature were awarded by U.S. universities between FY1976 and FY1980.

[2] See the reported means for measures 03 and 01 in Table 7.2.

[3] As mentioned in Chapter I, the primary criterion for inclusion was that a university had awarded at least 4 doctorates in German during the FY1976-78 period.

Before examining individual program results presented in Table 7.1, the reader is urged to refer to Chapter II, in which each of the 12 measures used in the assessment is discussed. Summary statistics describing every measure are given in Table 7.2. For eight of the measures, data are reported for at least 45 of the 48 German programs. For measures 04-07, which pertain to characteristics of the program graduates, data are presented for less than two-thirds of the programs; the others had too few graduates on which to base statistics.[4]

Intercorrelations among the 12 measures (Pearson product-moment coefficients) are given in Table 7.3. Of particular note are the high positive correlations of the measures of faculty size (01), number of recent program graduates (02), and library index (12) with reputational survey ratings (08, 09). Figure 7.1 illustrates the relation between the mean rating of the scholarly quality of faculty (measure 08) and the number of faculty members (measure 01) for each of 48 programs in German. Figure 7.2 plots the mean rating of program effectiveness (measure 09) against the total number of FY1976-80 program graduates (measure 02). Although in both figures there is a significant positive correlation between program size and reputational rating, it is quite apparent that some of the smaller programs received high mean ratings and that some of the larger programs received low mean ratings.

Table 7.4 describes the 95 faculty members who participated in the evaluation of German programs. These individuals constituted 63 percent of those asked to respond to the survey in this discipline and 21 percent of the faculty population in the 48 research-doctorate programs being evaluated.[5] Only one-fifth of the survey participants had earned their highest degree since 1970, and almost two-thirds were full professors.

To assist the reader in interpreting results of the survey evaluations, estimated standard errors have been computed for mean ratings of the scholarly quality of faculty in 48 German programs (and are given in Table 7.1). For each program the mean rating and an associated "confidence interval" of 1.5 standard errors are illustrated in Figure 7.3 (listed in order of highest to lowest mean rating). In comparing two programs, if their confidence intervals do not overlap, one may conclude that there is a significant difference in their mean ratings at a .05 level of significance.[6] From this figure it is also apparent that one should have somewhat more confidence in the accuracy

of the mean ratings of higher-rated programs than lower-rated programs. This generalization results primarily from the fact that evaluators are not as likely to be familiar with the less prestigious programs, and consequently the mean ratings of these programs are usually based on fewer survey responses.

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[4] As mentioned in Chapter II, data for measures 04-07 are not reported if they are based on the survey responses of fewer than 10 FY1975-79 program graduates.

[5] See Table 2.3 in Chapter II.

[6] See pp. 28-30 for a discussion of the interpretation of mean ratings and associated confidence intervals.

TABLE 7.1 Program Measures (Raw and Standardized Values) in German Lang. & Lit.

Prog No.	University - Department/Academic Unit	Program Size (01)	(02)	(03)	Characteristics of Program Graduates (04)	(05)	(06)	(07)
001.	Brown University	8	9	7	NA	NA	NA	NA
	German	*47*	*45*	*41*				
002.	Bryn Mawr College	5	5	6	NA	NA	NA	NA
	German	*40*	*39*	*40*				
003.	CUNY-Graduate School	8	7	12	NA	NA	NA	NA
	Germanic Languages and Literature	*47*	*42*	*46*				
004.	California, University of-Berkeley	16	23	34	.23	9.2	.46	.32
	German	*66*	*65*	*69*	*46*	*48*	*44*	*55*
005.	California, University of-Davis	8	7	3	.10	NA	.30	.10
	German and Russian	*47*	*42*	*37*	*35*		*30*	*39*
006.	California, University of-Irvine	7	5	11	NA	NA	NA	NA
	*German**	*45*	*39*	*45*				
007.	California, University of-Los Angeles	20	11	28	.17	8.8	.58	.42
	Germanic Languages	*75*	*47*	*63*	*41*	*51*	*57*	*62*
008.	California, University of-San Diego	4	1	10	NA	NA	NA	NA
	*Literature**	*38*	*33*	*44*				
009.	California, University of-Santa Barbara	6	6	9	NA	NA	NA	NA
	Germanic & Slavic Languages & Literatures	*42*	*40*	*43*				
010.	Chicago, University of	6	11	14	.50	8.8	.46	.09
	Germanic Languages and Literatures	*42*	*47*	*49*	*68*	*51*	*44*	*39*
011.	Cincinnati, University of	8	11	22	.12	9.8	.71	.29
	German	*47*	*47*	*57*	*37*	*44*	*68*	*54*
012.	Colorado, University of	5	10	3	.36	8.0	.40	.10
	Germanic Languages and Literatures	*40*	*46*	*37*	*57*	*57*	*39*	*39*
013.	Connecticut, University of-Storrs	8	11	5	.31	8.3	.54	.15
	Germanic and Slavic Languages	*47*	*47*	*39*	*52*	*54*	*52*	*43*
014.	Cornell University-Ithaca	13	13	19	.38	6.4	.53	.33
	Germanic Studies	*59*	*50*	*54*	*58*	*68*	*52*	*56*
015.	Harvard University	6	21	23	.25	7.9	.36	.21
	Germanic Languages and Literatures	*42*	*62*	*58*	*47*	*57*	*35*	*48*
016.	Illinois, University-Urbana/Champaign	11	14	16	.33	8.0	.64	.43
	Germanic Languages and Literatures	*54*	*52*	*51*	*54*	*57*	*62*	*63*
017.	Indiana University-Bloomington	18	26	30	.32	11.3	.68	.13
	Germanic Languages	*71*	*69*	*65*	*53*	*33*	*66*	*42*
018.	Iowa, University of-Iowa City	10	4	12	NA	NA	NA	NA
	German	*52*	*37*	*46*				
019.	Johns Hopkins University	4	19	15	.44	8.8	.56	.13
	German	*38*	*59*	*50*	*63*	*51*	*55*	*41*
020.	Kansas, University of	9	8	26	NA	NA	NA	NA
	Germanic Languages and Literatures	*49*	*43*	*61*				

* indicates program was initiated since 1970.

NOTE: On the first line of data for every program, raw values for each measure are reported; on the second line values are reported in standardized form, with mean = 50 and standard deviation = 10. "NA" indicates that the value for a measure is not available.

TABLE 7.1 Program Measures (Raw and Standardized Values) in German Lang. & Lit.

Prog No.	Survey Results (08)	(09)	(10)	(11)	University Library (12)	Survey Ratings Standard Error (08)	(09)	(10)	(11)
001.	3.0	1.8	1.0	1.2	-1.1	.09	.07	.08	.06
	51	*52*	*54*	*51*	*35*				
002.	1.9	1.1	1.0	0.9	NA	.12	.10	.06	.07
	40	*38*	*53*	*41*					
003.	2.4	1.3	0.7	0.9	NA	.10	.09	.08	.07
	45	*41*	*41*	*42*					
004.	4.3	2.4	0.9	1.7	2.2	.07	.05	.07	.06
	65	*64*	*49*	*64*	*66*				
005.	2.3	1.4	0.9	1.0	0.6	.11	.08	.07	.07
	43	*44*	*49*	*44*	*51*				
006.	3.0	1.8	1.0	1.3	NA	.08	.06	.09	.07
	51	*51*	*53*	*54*					
007.	3.5	2.1	1.1	1.2	2.0	.07	.04	.06	.06
	57	*57*	*58*	*51*	*64*				
008.	1.9	0.9	0.7	0.9	-0.0	.12	.09	.06	.07
	40	*35*	*42*	*42*	*45*				
009.	3.4	1.8	1.1	1.4	-0.1	.09	.06	.03	.07
	55	*51*	*57*	*55*	*44*				
010.	2.6	1.6	0.5	1.0	0.9	.11	.08	.07	.06
	47	*48*	*33*	*43*	*54*				
011.	2.6	1.7	0.8	1.2	-0.2	.10	.07	.07	.07
	47	*49*	*46*	*49*	*43*				
012.	1.5	1.0	0.4	0.9	-0.9	.11	.08	.06	.07
	35	*35*	*25*	*40*	*37*				
013.	2.3	1.5	0.9	1.1	-0.5	.09	.09	.05	.07
	44	*46*	*49*	*47*	*41*				
014.	4.1	2.2	1.4	1.5	1.6	.08	.06	.06	.06
	63	*60*	*74*	*60*	*61*				
015.	3.7	2.1	0.6	1.7	3.0	.08	.05	.07	.06
	59	*57*	*36*	*63*	*74*				
016.	3.5	2.2	1.0	1.3	2.0	.09	.06	.06	.07
	57	*59*	*52*	*52*	*64*				
017.	4.3	2.5	1.0	1.7	0.9	.07	.06	.06	.05
	65	*66*	*54*	*64*	*54*				
018.	1.6	0.9	0.9	0.7	0.3	.10	.08	.06	.06
	36	*35*	*50*	*36*	*48*				
019.	2.7	1.8	0.7	1.1	-0.4	.10	.08	.09	.07
	48	*51*	*41*	*48*	*41*				
020.	2.0	1.4	0.9	0.9	0.1	.10	.08	.07	.07
	41	*43*	*48*	*41*	*46*				

NOTE: On the first line of data for every program, raw values for each measure are reported; on the second line values are reported in standardized form, with mean = 50 and standard deviation = 10. "NA" indicates that the value for a measure is not available.

TABLE 7.1 Program Measures (Raw and Standardized Values) in German Lang. & Lit.

Prog No.	University - Department/Academic Unit	Program Size (01)	(02)	(03)	Characteristics of Program Graduates (04)	(05)	(06)	(07)
021.	Massachusetts, University of-Amherst	17	22	15	.14	9.3	.43	.10
	Germanic Languages and Literature	*68*	*63*	*50*	*39*	*47*	*42*	*39*
022.	Michigan, University of-Ann Arbor	21	17	10	.29	10.5	.50	.19
	Germanic Language and Literature	*78*	*56*	*44*	*51*	*38*	*49*	*46*
023.	Minnesota, University of	7	12	9	.36	11.8	.64	.27
	German	*45*	*49*	*43*	*57*	*29*	*62*	*52*
024.	Nebraska, University of-Lincoln	5	11	5	NA	NA	NA	NA
	Modern Languages and Literatures	*40*	*47*	*39*				
025.	New York University	8	20	9	.08	9.8	.39	.08
	Germanic Languages and Literatures	*47*	*60*	*43*	*33*	*44*	*38*	*38*
026.	North Carolina, University of-Chapel Hill	8	17	7	.18	8.9	.45	.10
	Germanic Languages	*47*	*56*	*41*	*42*	*50*	*44*	*39*
027.	Northwestern University	10	10	8	NA	NA	NA	NA
	German Language and Literature	*52*	*46*	*42*				
028.	Ohio State University-Columbus	13	17	23	.32	10.0	.61	.39
	German	*59*	*56*	*58*	*53*	*42*	*59*	*60*
029.	Oregon, University of-Eugene	8	13	9	.54	8.7	.50	.42
	German Languages and Literatures	*47*	*50*	*43*	*71*	*52*	*49*	*62*
030.	Pennsylvania State University	8	9	2	NA	NA	NA	NA
	German	*47*	*45*	*36*				
031.	Pennsylvania, University of	7	16	23	.19	9.3	.39	.08
	Germanic Languages and Literatures	*45*	*55*	*58*	*42*	*47*	*38*	*38*
032.	Pittsburgh, University of	7	3	6	NA	NA	NA	NA
	Germanic Languages and Literatures	*45*	*36*	*40*				
033.	Princeton University	9	15	17	.39	6.5	.62	.54
	Germanic Languages and Literatures	*49*	*53*	*52*	*58*	*68*	*60*	*71*
034.	Rice University	6	8	14	NA	NA	NA	NA
	German and Russian	*42*	*43*	*49*				
035.	Rutgers, The State University-New Brunswick	12	8	41	NA	NA	NA	NA
	German	*56*	*43*	*77*				
036.	SUNY at Albany	7	7	25	NA	NA	NA	NA
	*Germanic Languages and Literature**	*45*	*42*	*60*				
037.	SUNY at Buffalo	7	5	9	NA	NA	NA	NA
	Modern Languages and Literatures	*45*	*39*	*43*				
038.	SUNY at Stony Brook	6	5	15	NA	NA	NA	NA
	*German Language and Literature**	*42*	*39*	*50*				
039.	Southern California, University of	5	17	23	.36	9.5	.54	.15
	German	*40*	*56*	*58*	*56*	*46*	*52*	*43*
040.	Stanford University	9	24	20	.30	8.9	.67	.38
	German Studies	*49*	*66*	*55*	*52*	*50*	*65*	*60*

* indicates program was initiated since 1970.

NOTE: On the first line of data for every program, raw values for each measure are reported; on the second line values are reported in standardized form, with mean = 50 and standard deviation = 10. "NA" indicates that the value for a measure is not available.

TABLE 7.1 Program Measures (Raw and Standardized Values) in German Lang. & Lit.

Prog	Survey Results				University Library	Survey Ratings Standard Error			
No.	(08)	(09)	(10)	(11)	(12)	(08)	(09)	(10)	(11)
021.	3.5	2.0	1.0	1.5	-0.7	.08	.06	.07	.06
	57	*56*	*54*	*59*	*38*				
022.	3.4	2.1	1.0	1.3	1.8	.09	.05	.08	.07
	56	*57*	*52*	*52*	*62*				
023.	3.0	1.9	1.1	1.3	1.2	.09	.06	.08	.07
	51	*54*	*60*	*52*	*56*				
024.	1.4	1.0	0.9	0.7	-0.5	.11	.08	.05	.07
	35	*35*	*49*	*35*	*40*				
025.	2.6	1.6	0.8	1.0	0.5	.10	.07	.09	.07
	47	*47*	*45*	*43*	*50*				
026.	3.1	1.9	1.0	1.3	1.0	.08	.05	.06	.06
	52	*54*	*53*	*52*	*55*				
027.	3.3	1.8	0.8	1.4	0.3	.09	.07	.06	.06
	54	*51*	*45*	*56*	*48*				
028.	3.2	2.0	0.9	1.3	0.9	.08	.06	.09	.06
	53	*56*	*49*	*53*	*54*				
029.	2.4	1.6	1.0	0.9	-0.9	.10	.08	.04	.07
	45	*47*	*53*	*41*	*36*				
030.	2.2	1.4	0.9	1.0	0.7	.11	.08	.08	.07
	43	*44*	*51*	*43*	*52*				
031.	3.3	2.0	0.8	1.4	0.7	.08	.06	.08	.06
	55	*55*	*44*	*55*	*52*				
032.	2.1	1.1	0.7	1.0	0.1	.10	.08	.06	.07
	42	*39*	*43*	*44*	*46*				
033.	4.5	2.5	1.4	1.8	0.9	.07	.06	.07	.04
	67	*66*	*71*	*67*	*54*				
034.	1.8	1.3	0.8	0.9	-1.4	.12	.09	.09	.07
	39	*41*	*45*	*40*	*31*				
035.	1.8	1.2	0.8	0.9	0.8	.11	.09	.08	.07
	38	*40*	*45*	*40*	*53*				
036.	3.2	1.7	1.4	1.4	-1.0	.09	.07	.07	.06
	53	*50*	*71*	*56*	*36*				
037.	2.7	1.5	0.9	1.1	0.3	.08	.07	.05	.06
	48	*45*	*48*	*47*	*48*				
038.	1.8	1.1	0.7	0.8	-0.6	.13	.09	.09	.07
	38	*38*	*41*	*38*	*39*				
039.	1.8	1.3	0.5	0.8	0.4	.13	.10	.08	.07
	38	*41*	*31*	*39*	*49*				
040.	4.1	2.4	1.2	1.6	2.0	.08	.06	.07	.05
	63	*64*	*64*	*62*	*65*				

NOTE: On the first line of data for every program, raw values for each measure are reported; on the second line values are reported in standardized form, with mean = 50 and standard deviation = 10. "NA" indicates that the value for a measure is not available.

TABLE 7.1 Program Measures (Raw and Standardized Values) in German Lang. & Lit.

Prog No.	University - Department/Academic Unit	Program Size (01)	(02)	(03)	Characteristics of Program Graduates (04)	(05)	(06)	(07)
041.	Tennessee, University of-Knoxville	3	11	NA	.20	11.5	.50	.10
	Germanic and Slavic Languages	*35*	*47*		*43*	*31*	*49*	*39*
042.	Texas, University of-Austin	17	20	34	.45	8.5	.39	.28
	Germanic Languages	*68*	*60*	*69*	*64*	*53*	*38*	*52*
043.	Vanderbilt University	7	12	5	.46	7.0	.46	.18
	Germanic and Slavic Languages	*45*	*49*	*39*	*64*	*64*	*44*	*45*
044.	Virginia, University of	14	6	9	NA	NA	NA	NA
	Germanic Languages and Literature	*61*	*40*	*43*				
045.	Washington University-Saint Louis	7	10	36	.23	10.0	.50	.50
	German Languages and Literature	*45*	*46*	*72*	*46*	*42*	*49*	*68*
046.	Washington, University of-Seattle	11	34	13	.11	8.0	.56	.22
	Germanics	*54*	*80*	*47*	*36*	*57*	*54*	*48*
047.	Wisconsin, University of-Madison	13	26	NA	.16	8.5	.42	.26
	German	*59*	*69*		*40*	*53*	*41*	*51*
048.	Yale University	13	19	18	.21	6.3	.64	.43
	Germanic Languages and Literatures	*59*	*59*	*53*	*44*	*69*	*62*	*63*

* indicates program was initiated since 1970.

NOTE: On the first line of data for every program, raw values for each measure are reported; on the second line values are reported in standardized form, with mean = 50 and standard deviation = 10. "NA" indicates that the value for a measure is not available.

TABLE 7.1 Program Measures (Raw and Standardized Values) in German Lang. & Lit.

Prog	Survey Results				University Library	Survey Ratings Standard Error			
No.	(08)	(09)	(10)	(11)	(12)	(08)	(09)	(10)	(11)
041.	1.1	0.7	0.7	0.6	-0.4	.12	.09	.07	.06
	31	*31*	*40*	*32*	*41*				
042.	4.2	2.5	1.0	1.6	1.6	.06	.06	.06	.06
	63	*65*	*54*	*62*	*61*				
043.	1.3	1.0	0.8	0.5	-0.7	.11	.08	.07	.06
	33	*36*	*44*	*29*	*38*				
044.	4.0	2.2	1.4	1.7	0.7	.08	.06	.07	.05
	62	*59*	*74*	*65*	*52*				
045.	3.4	2.0	0.8	1.5	-0.4	.08	.06	.07	.06
	55	*55*	*44*	*58*	*41*				
046.	3.5	2.1	1.0	1.4	1.5	.06	.05	.05	.07
	57	*57*	*54*	*54*	*59*				
047.	4.5	2.6	1.2	1.9	1.6	.07	.06	.05	.04
	67	*67*	*62*	*69*	*60*				
048.	4.5	2.6	0.9	1.8	2.1	.07	.05	.05	.04
	67	*68*	*52*	*67*	*65*				

NOTE: On the first line of data for every program, raw values for each measure are reported; on the second line values are reported in standardized form, with mean = 50 and standard deviation = 10. "NA" indicates that the value for a measure is not available.

TABLE 7.2 Summary Statistics Describing Each Program Measure--German Language & Literature

Measure	Number of Programs Evaluated	Mean	Standard Deviation	DECILES								
				1	2	3	4	5	6	7	8	9
Program Size												
01 Raw Value	48	9	4	5	6	7	7	8	8	10	13	16
Std Value	48	50	10	40	42	45	45	47	47	52	59	66
02 Raw Value	48	13	7	5	7	8	10	11	13	17	19	22
Std Value	48	50	10	39	42	43	46	47	50	56	59	63
03 Raw Value	46	15	10	5	7	9	10	13	15	19	23	29
Std Value	46	50	10	39	41	43	44	47	50	54	58	64
Program Graduates												
04 Raw Value	30	.28	.12	.11	.16	.19	.23	.29	.32	.36	.38	.45
Std Value	30	50	10	36	40	43	46	51	53	57	58	64
05 Raw Value	29	8.9	1.4	11.3	10.0	9.6	9.2	8.8	8.7	8.5	8.0	7.0
Std Value	29	50	10	32	42	45	48	51	51	53	56	64
06 Raw Value	30	.51	.10	.39	.40	.45	.46	.50	.54	.56	.62	.64
Std Value	30	50	10	38	39	44	45	49	53	55	61	63
07 Raw Value	30	.25	.14	.09	.10	.13	.15	.21	.27	.32	.39	.43
Std Value	30	50	10	39	39	41	43	47	51	55	60	63
Survey Results												
08 Raw Value	48	2.9	.9	1.6	1.9	2.3	2.6	3.0	3.2	3.4	3.6	4.2
Std Value	48	50	10	36	39	44	47	51	53	55	58	64
09 Raw Value	48	1.7	.5	1.0	1.2	1.4	1.6	1.8	1.9	2.0	2.1	2.4
Std Value	48	50	10	36	40	44	48	52	54	56	58	64
10 Raw Value	48	.9	.2	.7	.7	.8	.9	.9	1.0	1.0	1.0	1.2
Std Value	48	50	10	41	41	45	50	50	55	55	55	64
11 Raw Value	48	1.2	.3	.8	.9	1.0	1.0	1.2	1.3	1.4	1.5	1.7
Std Value	48	50	10	38	41	44	44	50	53	56	59	64
University Library												
12 Raw Value	45	.5	1.0	-.9	-.5	-.4	.1	.4	.7	.9	1.6	2.0
Std Value	45	50	10	37	40	41	46	49	52	54	61	64

NOTE: Standardized values reported in the preceding table have been computed from exact values of the mean and standard deviation and not the rounded values reported here.

TABLE 7.3 Intercorrelations Among Program Measures on 48 Programs in German Language & Literature

	Measure											
	01	02	03	04	05	06	07	08	09	10	11	12
Program Size												
01		.44	.41	-.16	-.02	.14	.25	.62	.64	.43	.54	.52
02			.32	-.24	.03	.09	-.05	.58	.66	.12	.52	.51
03				-.05	-.19	.21	.42	.41	.44	.06	.40	.34
Program Graduates												
04					.20	.15	.17	-.14	-.09	-.06	-.19	-.17
05						-.10	.32	.24	.20	.21	.21	.18
06							.52	.24	.29	.36	.20	.10
07								.50	.51	.52	.46	.31
Survey Results												
08									.98	.60	.97	.65
09										.56	.94	.66
10											.57	.25
11												.58
University Library												
12												

NOTE: Since in computing correlation coefficients program data must be available for both of the measures being correlated, the actual number of programs on which each coefficient is based varies.

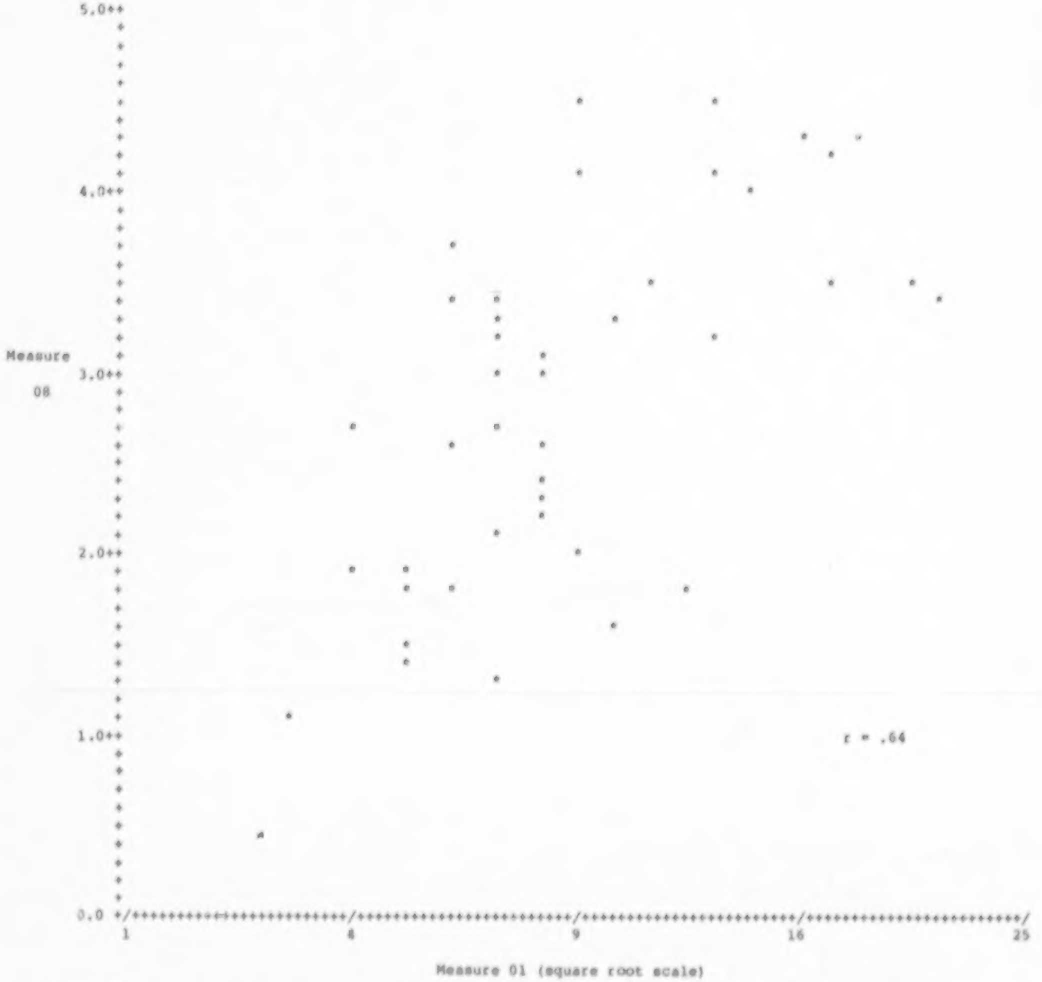

FIGURE 7.1 Mean rating of scholarly quality of faculty (measure 08) versus number of faculty members (measure 01)--48 programs in German language & literature.

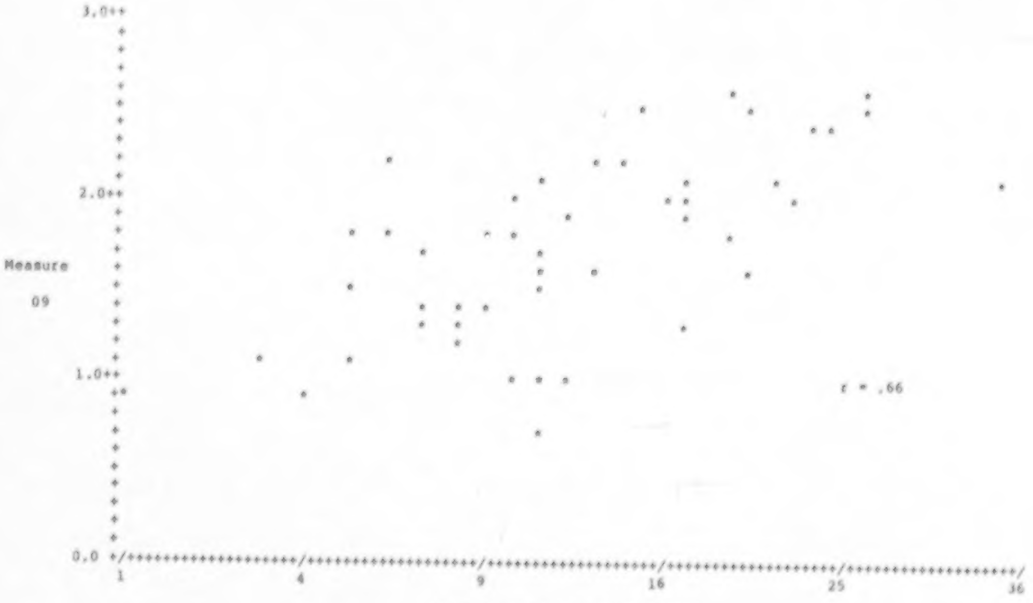

FIGURE 7.2 Mean rating of program effectiveness in educating research scholars/scientists (measure 09) versus number of graduates in last five years (measure 02)--48 programs in German language & literature.

TABLE 7.4 Characteristics of Survey Participants in German Language & Literature

	Respondents	
	N	%
Field of Specialization		
German Language and Literature	84	88
Other/Unknown	11	12
Faculty Rank		
Professor	63	66
Associate Professor	24	25
Assistant Professor	8	8
Year of Highest Degree		
Pre-1950	6	6
1950-59	26	27
1960-69	42	44
Post-1969	19	20
Unknown	2	2
Evaluator Selection		
Nominated by Institution	83	87
Other	12	13
Survey Form		
With Faculty Names	89	94
Without Names	6	6
Total Evaluators	95	100

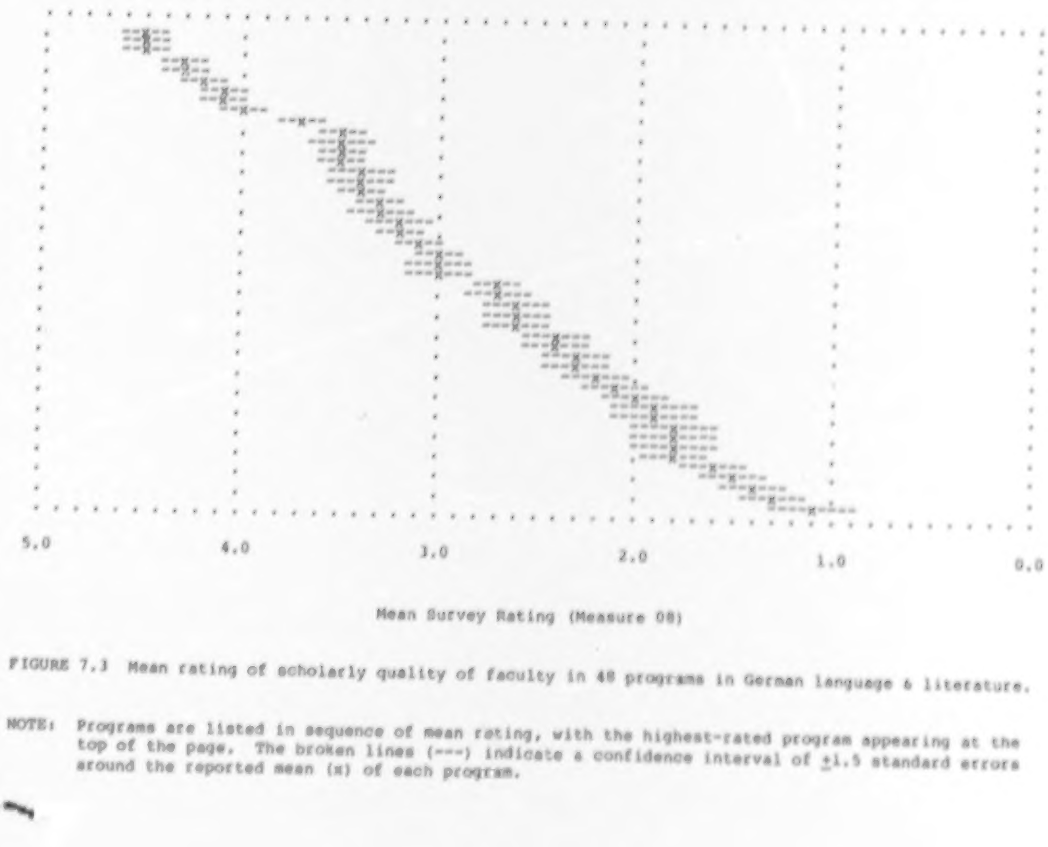

FIGURE 7.3 Mean rating of scholarly quality of faculty in 48 programs in German language & literature.

NOTE: Programs are listed in sequence of mean rating, with the highest-rated program appearing at the top of the page. The broken lines (---) indicate a confidence interval of ±1.5 standard errors around the reported mean (x) of each program.

VIII
Linguistics Programs

In this chapter 35 research-doctorate programs in linguistics are assessed. These programs, according to the information supplied by their universities, have accounted for 652 doctoral degrees awarded during the FY1976-80 period--approximately 76 percent of the aggregate number of linguistics doctorates earned from U.S. universities in this five-year span.[1] It should be noted that this aggregate number probably includes a significant number of doctorates in this discipline earned outside departments of linguistics. On the average, 34 full-time and part-time students intending to earn doctorates were enrolled in a program in December 1980, with an average faculty size of 14 members.[2] All but one of the 35 programs, listed in Table 8.1, are located in linguistics departments. Only four of the programs were initiated since 1970, and no two programs are located in the same university. In addition to the 35 institutions represented in this discipline, another 4 were initially identified as meeting the criteria[3] for inclusion in the assessment:

University of Arkansas--Fayetteville
Columbia Teachers College
Columbia University
Illinois Institute of Technology

Linguistics programs at these four institutions have not been included in the evaluations in this discipline, since in each case the study coordinator either indicated that the institution did not at that time have a research-doctorate program in linguistics or failed to provide the information requested by the committee.

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[1] Data from the NRC's Survey of Earned Doctorates indicate that 854 research doctorates in linguistics were awarded by U.S. universities between FY1976 and FY1980.

[2] See the reported means for measures 03 and 01 in Table 8.2.

[3] As mentioned in Chapter I, the primary criterion for inclusion was that a university had awarded at least 5 doctorates in linguistics during the FY1976-78 period.

Before examining individual program results presented in Table 8.1, the reader is urged to refer to Chapter II, in which each of the 12 measures used in the assessment is discussed. Summary statistics describing every measure are given in Table 8.2. For eight of the measures, data are reported for at least 33 of the 35 linguistics programs. For measures 04-07, which pertain to characteristics of the program graduates, data are presented for only approximately 25 of the programs; the other 10 had too few graduates on which to base statistics.[4]

Intercorrelations among the 12 measures (Pearson product-moment coefficients) are given in Table 8.3. Of particular note are the high positive correlations of the measures of faculty size (01), number of recent program graduates (02), and measures pertaining to the employment of graduates (06, 07) with reputational survey ratings (08, 09). Figure 8.1 illustrates the relation between the mean rating of the scholarly quality of faculty (measure 08) and the number of faculty members (measure 01) for each of 35 programs in linguistics. Figure 8.2 plots the mean rating of program effectiveness (measure 09) against the total number of FY1976-80 program graduates (measure 02). Although in both figures there is a significant positive correlation between program size and reputational rating, it is quite apparent that some of the smaller programs received high mean ratings and that some of the larger programs received low mean ratings.

Table 8.4 describes the 105 faculty members who participated in the evaluation of linguistics programs. These individuals constituted 70 percent of those asked to respond to the survey in this discipline and 21 percent of the faculty population in the 35 research-doctorate programs being evaluated.[5] More than two-fifths of the survey participants had earned their highest degree since 1970, and approximately half were full professors.

To assist the reader in interpreting results of the survey evaluations, estimated standard errors have been computed for mean ratings of the scholarly quality of faculty in 35 linguistics programs (and are given in Table 8.1). For each program the mean rating and an associated "confidence interval" of 1.5 standard errors are illustrated in Figure 8.3 (listed in order of highest to lowest mean rating). In comparing two programs, if their confidence intervals do not overlap, one may conclude that there is a significant difference in their mean ratings at a .05 level of significance.[6] From this figure it is also apparent that one should have somewhat more confidence in the accuracy of the mean ratings of higher-rated programs than lower-rated programs. This generalization results primarily from the fact that evaluators are not as likely to be familiar with the less prestigious programs, and consequently the mean ratings of these programs are usually based on fewer survey responses.

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[4] As mentioned in Chapter II, data for measures 04-07 are not reported if they are based on the survey responses of fewer than 10 FY1975-79 program graduates.

[5] See Table 2.3 in Chapter II.

[6] See pp. 28-30 for a discussion of the interpretation of mean ratings and associated confidence intervals.

TABLE 8.1 Program Measures (Raw and Standardized Values) in Linguistics

Prog No.	University - Department/Academic Unit	Program Size			Characteristics of Program Graduates			
		(01)	(02)	(03)	(04)	(05)	(06)	(07)
001.	Arizona, University of-Tucson	6	9	17	NA	NA	NA	NA
	*Linguistics**	*41*	*42*	*43*				
002.	Brown University	10	9	31	NA	NA	NA	NA
	Linguistics	*45*	*42*	*49*				
003.	CUNY-Graduate School	9	13	35	.40	NA	.70	.40
	*Linguistics**	*44*	*45*	*50*	*52*		*56*	*58*
004.	California, University of-Berkeley	12	31	63	.27	8.5	.76	.46
	Linguistics	*47*	*60*	*62*	*45*	*45*	*60*	*62*
005.	California, University of-Los Angeles	40	45	46	.47	9.7	.58	.29
	Linguistics	*78*	*71*	*55*	*56*	*35*	*47*	*50*
006.	California, University of-San Diego	11	23	40	.35	6.0	.72	.44
	Linguistics	*46*	*54*	*52*	*49*	*65*	*57*	*61*
007.	Chicago, University of	24	21	45	.54	8.5	.58	.38
	Linguistics	*61*	*52*	*55*	*60*	*45*	*47*	*56*
008.	Connecticut, University of-Storrs	6	12	17	.50	7.5	.82	.27
	Linguistics	*41*	*45*	*43*	*58*	*53*	*64*	*49*
009.	Cornell University-Ithaca	26	31	40	.39	8.3	.57	.11
	Linguistics	*63*	*60*	*52*	*52*	*46*	*46*	*38*
010.	Florida, University of-Gainesville	6	16	33	.08	10.0	.15	.00
	*Linguistics**	*41*	*48*	*50*	*34*	*32*	*15*	*31*
011.	Georgetown University	15	51	128	.29	9.2	.59	.12
	Linguistics	*51*	*76*	*89*	*46*	*39*	*47*	*39*
012.	Harvard University	25	15	23	.62	8.2	.58	.42
	Linguistics	*62*	*47*	*45*	*64*	*47*	*47*	*59*
013.	Hawaii, University of	28	25	62	.38	8.8	.57	.13
	Linguistics	*65*	*55*	*62*	*51*	*42*	*46*	*40*
014.	Illinois, University-Urbana/Champaign	21	32	57	.21	8.8	.63	.15
	Linguistics	*57*	*61*	*60*	*42*	*43*	*50*	*41*
015.	Indiana University-Bloomington	10	24	59	.38	8.1	.65	.45
	Linguistics	*45*	*54*	*60*	*51*	*48*	*52*	*61*
016.	Kansas, University of	17	8	15	NA	NA	NA	NA
	Linguistics	*53*	*41*	*42*				
017.	Massachusetts Institute of Technology	9	32	37	.75	5.5	.75	.50
	Linguistics and Philosophy	*44*	*61*	*51*	*71*	*69*	*59*	*65*
018.	Massachusetts, University of-Amherst	9	21	32	.20	5.4	.75	.60
	Linguistics	*44*	*52*	*49*	*41*	*70*	*59*	*72*
019.	Michigan, University of-Ann Arbor	20	42	39	.38	8.0	.70	.37
	Linguistics	*56*	*69*	*52*	*51*	*49*	*55*	*56*
020.	Minnesota, University of	9	1	12	NA	NA	NA	NA
	Linguistics	*44*	*36*	*41*				

* indicates program was initiated since 1970.

NOTE: On the first line of data for every program, raw values for each measure are reported; on the second line values are reported in standardized form, with mean = 50 and standard deviation = 10. "NA" indicates that the value for a measure is not available.

TABLE 8.1 Program Measures (Raw and Standardized Values) in Linguistics

Prog No.	Survey Results (08)	(09)	(10)	(11)	University Library (12)	Survey Ratings Standard Error (08)	(09)	(10)	(11)
001.	2.7	1.6	1.8	1.3	0.9	.10	.10	.05	.07
	50	*51*	*70*	*53*	*51*				
002.	2.6	1.5	1.3	1.1	-1.1	.09	.07	.08	.06
	48	*48*	*56*	*49*	*31*				
003.	2.9	1.6	1.0	1.3	NA	.09	.07	.07	.06
	52	*51*	*48*	*52*					
004.	3.9	2.0	0.8	1.9	2.2	.11	.09	.06	.03
	61	*58*	*41*	*65*	*64*				
005.	4.4	2.4	1.1	1.8	2.0	.07	.06	.06	.04
	66	*65*	*50*	*64*	*62*				
006.	3.8	2.2	1.2	1.8	-0.0	.07	.06	.07	.04
	60	*60*	*53*	*63*	*42*				
007.	3.9	2.2	1.0	1.6	0.9	.09	.06	.05	.05
	62	*61*	*47*	*59*	*51*				
008.	2.8	1.9	1.5	1.2	-0.5	.11	.08	.06	.07
	50	*55*	*60*	*49*	*37*				
009.	2.8	1.7	1.2	1.2	1.6	.10	.07	.09	.06
	50	*51*	*53*	*50*	*58*				
010.	0.9	0.6	NA	0.3	0.8	.10	.11	NA	.04
	32	*32*		*30*	*50*				
011.	2.4	1.5	0.9	1.1	-0.6	.10	.08	.06	.07
	46	*49*	*43*	*49*	*36*				
012.	3.3	1.8	0.8	1.4	3.0	.09	.07	.07	.06
	55	*54*	*41*	*55*	*72*				
013.	2.9	1.8	1.2	1.0	-0.1	.09	.08	.06	.06
	52	*53*	*52*	*47*	*41*				
014.	3.5	2.2	1.1	1.4	2.0	.08	.06	.06	.06
	57	*60*	*51*	*56*	*62*				
015.	2.5	1.5	0.6	1.4	0.9	.09	.07	.07	.05
	48	*49*	*34*	*55*	*52*				
016.	2.0	1.2	1.2	0.6	0.1	.10	.10	.11	.06
	42	*43*	*52*	*38*	*43*				
017.	4.7	2.6	0.9	2.0	-0.3	.07	.07	.05	.01
	69	*67*	*44*	*67*	*39*				
018.	3.8	2.4	1.6	1.6	-0.7	.10	.07	.07	.06
	60	*64*	*65*	*59*	*35*				
019.	2.6	1.6	0.5	1.2	1.8	.11	.08	.07	.07
	48	*49*	*33*	*50*	*60*				
020.	2.2	1.1	1.1	1.0	1.2	.09	.12	.07	.06
	44	*41*	*51*	*46*	*54*				

NOTE: On the first line of data for every program, raw values for each measure are reported; on the second line values are reported in standardized form, with mean = 50 and standard deviation = 10. "NA" indicates that the value for a measure is not available.

TABLE 8.1 Program Measures (Raw and Standardized Values) in Linguistics

Prog No.	University - Department/Academic Unit	Program Size			Characteristics of Program Graduates			
		(01)	(02)	(03)	(04)	(05)	(06)	(07)
021.	New York University	12	3	38	NA	NA	NA	NA
	Linguistics	*47*	*37*	*52*				
022.	North Carolina, University of-Chapel Hill	6	18	9	.27	9.3	.60	.27
	Linguistics and Non-Western Languages	*41*	*49*	*39*	*45*	*38*	*48*	*49*
023.	Northern Illinois University-De Kalb	2	2	10	NA	NA	NA	NA
	English	*37*	*36*	*40*				
024.	Northwestern University	13	11	10	.33	7.2	.55	.18
	Linguistics	*49*	*44*	*40*	*48*	*56*	*44*	*43*
025.	Ohio State University-Columbus	8	16	21	.27	7.5	.53	.20
	Linguistics	*43*	*48*	*45*	*45*	*53*	*43*	*44*
026.	Pennsylvania, University of	28	24	56	.30	8.5	.70	.30
	Linguistics	*65*	*54*	*59*	*47*	*45*	*55*	*51*
027.	Pittsburgh, University of	8	7	10	NA	NA	NA	NA
	General Linguistics	*43*	*41*	*40*				
028.	Rochester, University of	12	12	8	.42	7.0	.42	.08
	Foreign Languages, Literature & Linguistics	*47*	*45*	*39*	*53*	*57*	*35*	*36*
029.	SUNY at Buffalo	7	17	37	.07	6.3	.73	.20
	Linguistics	*42*	*49*	*51*	*34*	*62*	*58*	*44*
030.	Southern California, University of	11	12	60	.10	NA	NA	NA
	Linguistics	*46*	*45*	*61*	*36*			
031.	Stanford University	9	16	21	.52	8.0	.63	.32
	Linguistics	*44*	*48*	*45*	*59*	*49*	*51*	*52*
032.	Texas, University of-Austin	40	34	51	.15	7.8	.56	.22
	Linguistics	*78*	*62*	*57*	*38*	*51*	*45*	*46*
033.	Washington, University of-Seattle	7	9	16	NA	NA	NA	NA
	Linguistics	*42*	*42*	*42*				
034.	Wisconsin, University of-Madison	12	4	1	NA	NA	NA	NA
	Linguistics	*47*	*38*	*36*				
035.	Yale University	13	6	17	.80	6.5	.80	.20
	Linguistics	*49*	*40*	*43*	*74*	*61*	*63*	*44*

* indicates program was initiated since 1970.

NOTE: On the first line of data for every program, raw values for each measure are reported; on the second line values are reported in standardized form, with mean = 50 and standard deviation = 10. "NA" indicates that the value for a measure is not available.

TABLE 8.1 Program Measures (Raw and Standardized Values) in Linguistics

Prog No.	Survey Results				University Library	Survey Ratings Standard Error			
	(08)	(09)	(10)	(11)	(12)	(08)	(09)	(10)	(11)
021.	2.1	1.2	1.4	0.8	0.5	.10	.10	.11	.07
	43	*43*	*59*	*43*	*47*				
022.	0.9	0.6	0.3	0.4	1.0	.10	.09	.08	.06
	32	*32*	*27*	*34*	*52*				
023.	0.1	0.2	NA	0.1	NA	.05	.09	NA	.03
	24	*24*		*27*					
024.	1.8	1.1	1.1	0.6	0.3	.12	.11	.08	.06
	41	*42*	*50*	*37*	*45*				
025.	3.4	2.1	1.0	1.5	0.9	.07	.05	.07	.05
	57	*58*	*47*	*57*	*51*				
026.	3.9	2.0	1.3	1.5	0.7	.09	.07	.06	.05
	61	*57*	*56*	*58*	*49*				
027.	1.8	1.0	1.1	0.7	0.1	.12	.10	.08	.07
	41	*39*	*51*	*39*	*43*				
028.	1.3	0.7	0.5	0.3	-0.6	.12	.12	.13	.05
	36	*34*	*32*	*32*	*36*				
029.	2.0	1.2	0.8	1.0	0.3	.10	.09	.09	.06
	43	*43*	*41*	*47*	*45*				
030.	2.9	1.7	1.8	1.3	0.4	.10	.08	.07	.07
	52	*52*	*69*	*52*	*46*				
031.	3.6	2.1	1.5	1.6	2.0	.07	.06	.07	.05
	58	*59*	*61*	*59*	*62*				
032.	4.1	2.2	1.3	1.7	1.6	.08	.05	.07	.05
	63	*61*	*55*	*60*	*58*				
033.	2.8	1.7	1.3	1.4	1.5	.09	.08	.08	.06
	51	*53*	*57*	*55*	*57*				
034.	2.2	1.3	1.2	0.9	1.6	.10	.08	.11	.06
	45	*44*	*54*	*44*	*58*				
035.	2.9	1.4	0.9	1.3	2.1	.10	.08	.07	.06
	52	*46*	*45*	*53*	*63*				

NOTE: On the first line of data for every program, raw values for each measure are reported; on the second line values are reported in standardized form, with mean = 50 and standard deviation = 10. "NA" indicates that the value for a measure is not available.

TABLE 8.2 Summary Statistics Describing Each Program Measure--Linguistics

Measure	Number of Programs Evaluated	Mean	Standard Deviation	DECILES								
				1	2	3	4	5	6	7	8	9
Program Size												
01 Raw Value	35	14	9	6	7	9	9	11	12	14	21	27
Std Value	35	50	10	41	42	44	44	46	47	50	57	64
02 Raw Value	35	19	12	4	8	10	12	16	18	24	31	33
Std Value	35	50	10	38	41	43	45	48	49	54	60	62
03 Raw Value	35	34	24	10	12	17	21	33	37	40	51	60
Std Value	35	50	10	40	41	43	45	50	51	52	57	61
Program Graduates												
04 Raw Value	26	.36	.18	.09	.20	.27	.29	.35	.38	.40	.49	.57
Std Value	26	50	10	35	41	45	46	49	51	52	57	62
05 Raw Value	24	7.9	1.2	9.5	8.9	8.5	8.4	8.1	7.9	7.5	6.9	6.1
Std Value	24	50	10	37	41	45	46	48	50	53	58	64
06 Raw Value	25	.62	.13	.48	.56	.57	.58	.62	.65	.70	.73	.75
Std Value	25	50	10	39	45	46	47	50	52	56	58	60
07 Raw Value	25	.28	.15	.10	.13	.19	.20	.27	.30	.37	.42	.45
Std Value	25	50	10	38	40	44	45	49	51	56	59	61
Survey Results												
08 Raw Value	35	2.8	1.0	1.1	2.0	2.2	2.6	2.8	2.9	3.4	3.8	3.9
Std Value	35	50	10	34	43	45	48	50	51	56	60	61
09 Raw Value	35	1.6	.6	.7	1.1	1.3	1.5	1.6	1.7	1.9	2.1	2.2
Std Value	35	50	10	34	41	45	48	50	52	55	59	61
10 Raw Value	33	1.1	.3	.5	.8	.9	1.0	1.1	1.2	1.2	1.3	1.5
Std Value	33	50	10	32	41	44	47	50	53	53	56	62
11 Raw Value	35	1.2	.5	.4	.7	1.0	1.1	1.2	1.3	1.4	1.6	1.7
Std Value	35	50	10	33	40	46	48	50	53	55	59	61
University Library												
12 Raw Value	33	.8	1.0	-.6	-.3	.1	.4	.8	.9	1.5	1.7	2.0
Std Value	33	50	10	36	39	43	46	50	51	57	59	62

NOTE: Standardized values reported in the preceding table have been computed from exact values of the mean and standard deviation and not the rounded values reported here.

TABLE 8.3 Intercorrelations Among Program Measures on 35 Programs in Linguistics

	Measure											
	01	02	03	04	05	06	07	08	09	10	11	12
Program Size												
01		.57	.38	.07	-.37	-.11	-.12	.51	.46	-.02	.38	.36
02			.74	-.10	-.34	.03	.05	.50	.53	-.30	.49	.12
03				-.27	-.35	.04	-.04	.36	.39	-.05	.39	-.10
Program Graduates												
04					.24	.36	.29	.33	.25	-.16	.30	.20
05						.53	.46	.25	.25	.21	.27	-.38
06							.63	.49	.49	.25	.59	-.01
07								.57	.57	.10	.65	.04
Survey Results												
08									.98	.29	.96	.23
09										.35	.95	.16
10											.24	-.16
11												.29
University Library												
12												

NOTE: Since in computing correlation coefficients program data must be available for both of the measures being correlated, the actual number of programs on which each coefficient is based varies.

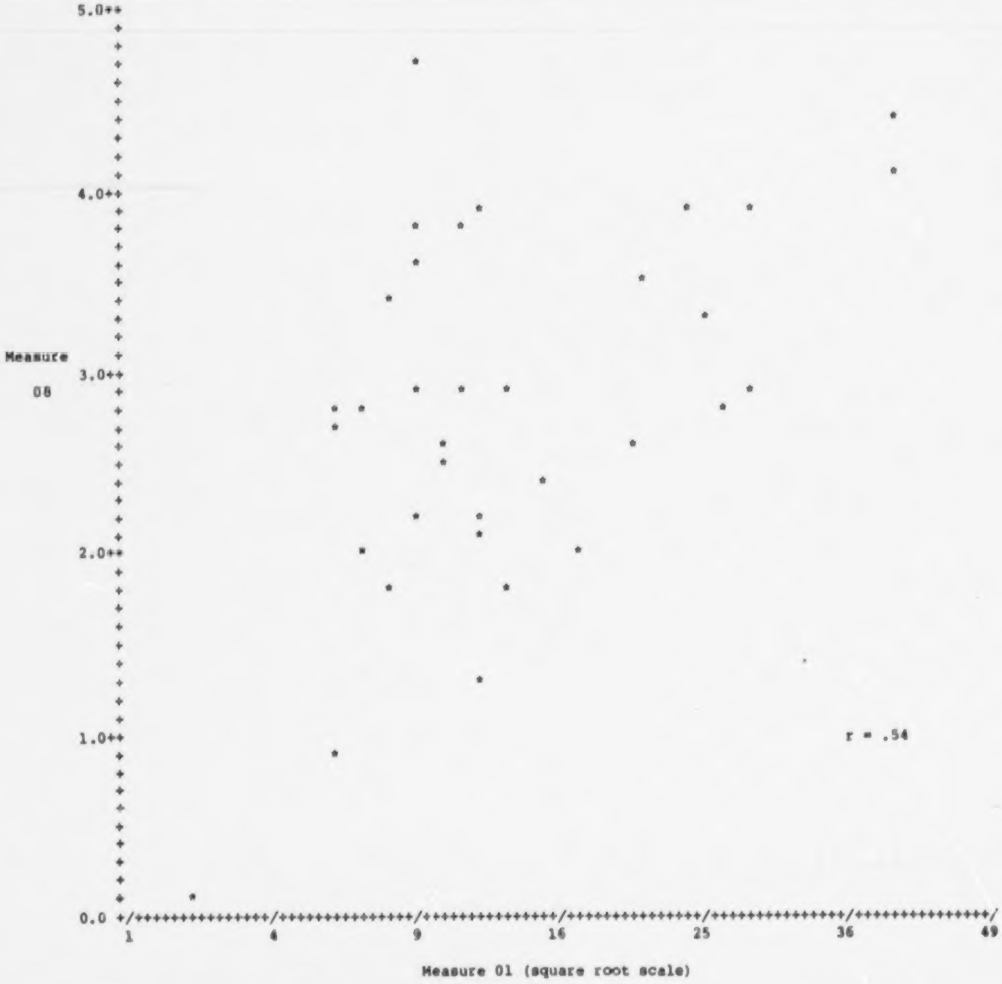

FIGURE 8.1 Mean rating of scholarly quality of faculty (measure 08) versus number of faculty members (measure 01)--35 programs in linguistics.

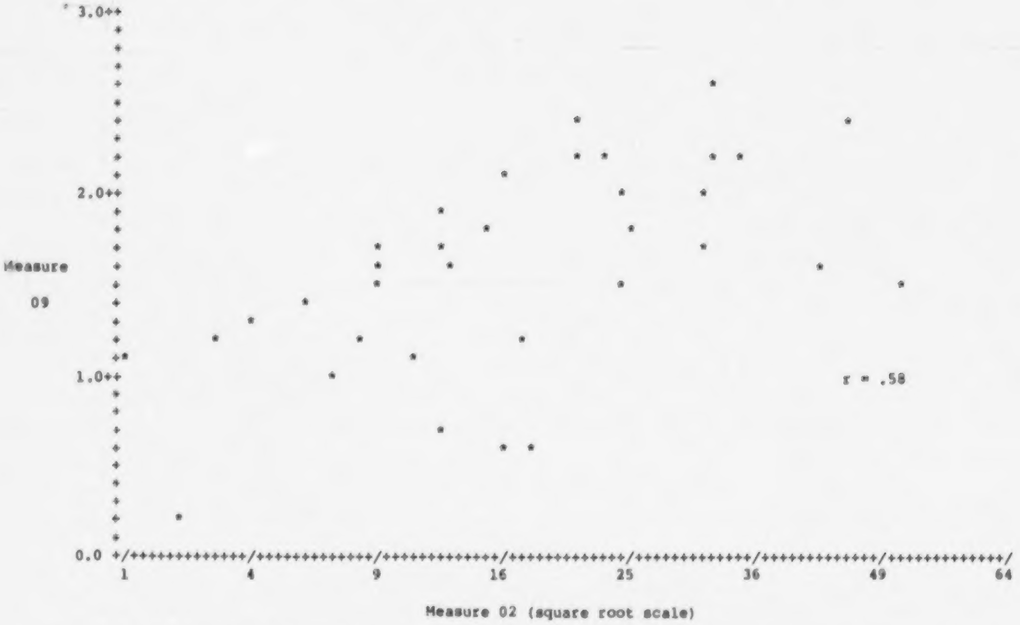

FIGURE 8.2 Mean rating of program effectiveness in educating research scholars/scientists (measure 09) versus number of graduates in last five years (measure 02)--35 programs in linguistics.

TABLE 8.4 Characteristics of Survey Participants in Linguistics

	Respondents	
	N	%
Field of Specialization		
Linguistics	97	92
Other/Unknown	8	8
Faculty Rank		
Professor	52	50
Associate Professor	35	33
Assistant Professor	18	17
Year of Highest Degree		
Pre-1950	5	5
1950-59	13	12
1960-69	42	40
Post-1969	44	41
Unknown	1	1
Evaluator Selection		
Nominated by Institution	85	81
Other	20	19
Survey Form		
With Faculty Names	94	90
Without Names	11	11
Total Evaluators	105	100

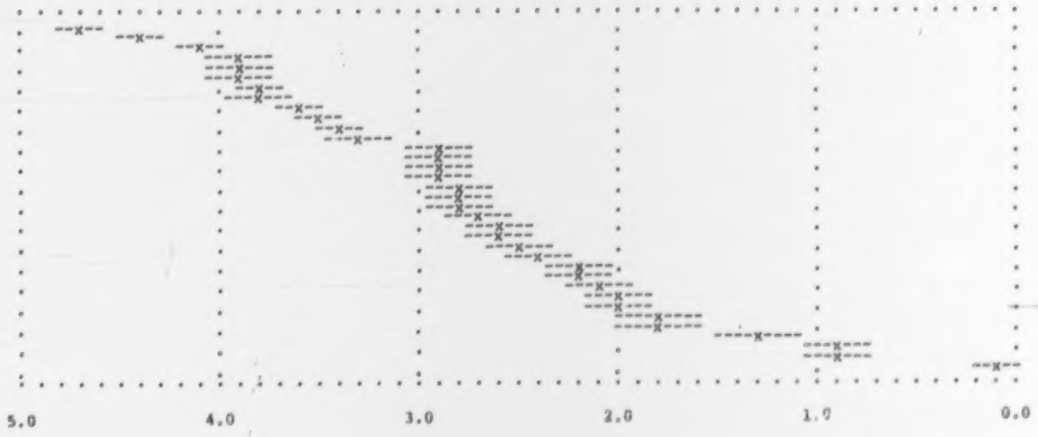

FIGURE 8.3 Mean rating of scholarly quality of faculty in 35 programs in linguistics.

NOTE: Programs are listed in sequence of mean rating, with the highest-rated program appearing at the top of the page. The broken lines (---) indicate a confidence interval of ±1.5 standard errors around the reported mean (x) of each program.

IX
Music Programs

In this chapter 53 research-doctorate programs in music are assessed. These programs, according to the information supplied by their universities, have accounted for 1,385 doctoral degrees awarded during the FY1976-80 period--approximately 71 percent of the aggregate number of music doctorates earned from U.S. universities in this five-year span.[1] The study committee has serious concerns about the completeness and accuracy of the program coverage in this discipline. In the instructions to the coordinators they were asked to provide faculty lists and other information for research-doctorate programs in "musicology." This instruction was in error since the committee intended to include all areas of research training in music. Some institutional coordinators furnished faculty lists and other information on only the musicology component of music programs, while some coordinators included other areas as well (e.g., theory and composition). Also of concern is the fact that several of the faculty lists provided apparently include performers who had little or no involvement in research. Furthermore, at least 1 of the 53 programs evaluated does not offer a research doctorate in any area of music, although those earning doctorates of musical arts at this institution do receive some research training. The committee seriously considered not reporting the results of its assessment of programs in this discipline (as suggested by a few survey evaluators), but decided that in view of the effort made by both the survey respondents and the program coordinators the results should be reported, along with a full explanation of the problems encountered.

On the average, 42 full-time and part-time students intending to earn doctorates were enrolled in a program in December 1980, with an average faculty size of 20 members.[2] Only three of the programs were initiated since 1970, and no two programs are located in the same university. In addition to the 53 institutions represented in this discipline, another 6 were initially identified as meeting the criteria[3] for inclusion in the assessment:

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[1] Data from the NRC's Survey of Earned Doctorates indicate that 1,946 research doctorates in music were awarded by U.S. universities between FY1976 and FY1980.

[2] See the reported means for measures 03 and 01 in Table 9.2.

University of Arizona--Tucson
Cleveland Institute of Music
Harvard University
University of Mississippi--Oxford
University of Northern Colorado--Greeley
Southern Baptist Theological
  Seminary--Kentucky

Music programs at these six institutions have not been included in the evaluations in this discipline, since in each case the study coordinator either indicated that the institution did not at that time have a research-doctorate program in music or failed to provide the information requested by the committee.

Before examining individual program results presented in Table 9.1, the reader is urged to refer to Chapter II, in which each of the 12 measures used in the assessment is discussed. Summary statistics describing every measure are given in Table 9.2. For all but one of the measures, data are reported for at least 48 of the 53 music programs. For measure 12, a composite index of the size of a university library, data are available for 41 programs. The programs not evaluated on measure 12 are typically smaller--in terms of faculty size and graduate student enrollment--than other music programs. Were data on this measure available for all 53 programs, it is likely that the reported mean would be appreciably lower (and that some of the correlations of this measure with others would be higher).

Intercorrelations among the 12 measures (Pearson product-moment coefficients) are given in Table 9.3. Of particular note are the high positive correlations of university library size (12) with reputational survey ratings (08, 09). The correlations of the measures of program size (01-03) with reputational survey ratings (08, 09) are much lower than the corresponding correlations in other disciplines. Figure 9.1 illustrates the relation between the mean rating of the scholarly quality of faculty (measure 08) and the number of faculty members (measure 01) for each of 53 programs in music. Figure 9.2 plots the mean rating of program effectiveness (measure 09) against the total number of FY1976-80 program graduates (measure 02). The lack of a strong relationship between measures is quite apparent in both figures.

Table 9.4 describes the 69 faculty members who participated in the evaluation of music programs. These individuals constituted only 43 percent of those asked to respond to the survey in this discipline and 6 percent of the faculty population in the 53 research-doctorate programs being evaluated.[4] Approximately half of the survey participants were musicologists, and another 19 percent (13 individuals) specialized in music theory and composition. The remainder (21 individuals) may include some faculty members who had little or no involvement in research training, but the exact number of such individuals is not known. More than one-third of the survey participants had earned their highest degree since 1970, and almost half held the rank of full professor.

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[3] As mentioned in Chapter I, the primary criterion for inclusion was that a university had awarded at least 9 doctorates in music during the FY1976-78 period.

Two exceptions should be mentioned with regard to the survey evaluations in this discipline. First, it should be noted that the program at the Eastman School of Music was identified on the survey form as "University of Rochester--Music." Also, the program at the Julliard School of Music does not conform with a typical research-doctorate program in that it is specifically intended for "those students showing greatest promise for a major career as performing artists," but it does involve seminars dealing with a "scholarly approach to the study of music." In addition to these two exceptions, as has been noted earlier, several of the faculty lists included the names of performance teachers who were not involved in the research aspects of a program. In reporting the results in this discipline, the committee wishes to emphasize these deficiencies and the likelihood that they may have influenced the reputational ratings as well as other program measures.

To assist the reader in interpreting results of the survey evaluations, estimated standard errors have been computed for mean ratings of the scholarly quality of faculty in 53 music programs (and are given in Table 9.1). For each program the mean rating and an associated "confidence interval" of 1.5 standard errors are illustrated in Figure 9.3 (listed in order of highest to lowest mean rating). In comparing two programs, if their confidence intervals do not overlap, one may conclude that there is a significant difference in their mean ratings at a .05 level of significance.[5] From this figure it is also apparent that one should have somewhat more confidence in the accuracy of the mean ratings of higher-rated programs than lower-rated programs. This generalization results primarily from the fact that evaluators are not as likely to be familiar with the less prestigious programs, and consequently the mean ratings of these programs are usually based on fewer survey responses.

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[4] See Table 2.3 in Chapter II.

[5] See pp. 28-30 for a discussion of the interpretation of mean ratings and associated confidence intervals.

TABLE 9.1 Program Measures (Raw and Standardized Values) in Music

Prog No.	University - Department/Academic Unit	Program Size			Characteristics of Program Graduates			
		(01)	(02)	(03)	(04)	(05)	(06)	(07)
001.	Ball State University	54	21	39	.00	9.8	.69	.15
	*Music**	*71*	*48*	*49*	*37*	*51*	*54*	*43*
002.	Boston University	11	2	9	.00	13.0	.58	.26
	Music	*44*	*40*	*39*	*37*	*35*	*45*	*52*
003.	Brandeis University	10	3	25	NA	NA	NA	NA
	Music	*43*	*41*	*44*				
004.	CUNY-Graduate School	19	17	65	.27	11.7	.43	.14
	Music	*49*	*46*	*57*	*66*	*41*	*34*	*42*
005.	California, University of-Berkeley	14	26	33	.17	7.3	.41	.18
	Music	*46*	*50*	*47*	*55*	*63*	*32*	*45*
006.	California, University of-Los Angeles	32	27	50	.18	11.5	.68	.29
	Music	*57*	*50*	*52*	*56*	*42*	*53*	*54*
007.	California, University of-San Diego	17	11	26	.00	9.3	NA	NA
	*Music**	*48*	*44*	*45*	*37*	*53*		
008.	California, University of-Santa Barbara	9	16	33	.08	7.3	.50	.25
	Music	*43*	*46*	*47*	*46*	*63*	*39*	*51*
009.	Case Western Reserve University	6	12	12	.04	14.0	.54	.13
	Music	*41*	*44*	*40*	*42*	*30*	*43*	*41*
010.	Catholic University of America	7	16	18	.04	10.9	.70	.22
	Music	*42*	*46*	*42*	*42*	*45*	*55*	*48*
011.	Chicago, University of	11	13	45	.27	9.5	.82	.64
	Music	*44*	*45*	*51*	*66*	*52*	*64*	*83*
012.	Cincinnati, University of	19	43	13	.03	10.5	.72	.27
	College Conservatory of Music	*49*	*57*	*41*	*41*	*47*	*56*	*53*
013.	Colorado, University of	41	11	11	.11	10.5	.72	.19
	Music	*63*	*44*	*40*	*49*	*47*	*57*	*46*
014.	Columbia University	13	10	75	.15	9.5	.46	.23
	Music	*45*	*43*	*60*	*53*	*52*	*36*	*49*
015.	Cornell University-Ithaca	14	20	27	.21	7.8	.53	.21
	Music	*46*	*48*	*45*	*59*	*61*	*41*	*48*
016.	Florida State University-Tallahassee	26	37	143	.11	10.5	.72	.22
	Music	*54*	*54*	*82*	*49*	*47*	*56*	*48*
017.	Illinois, University-Urbana/Champaign	10	13	37	.06	10.0	.77	.35
	Music	*43*	*45*	*48*	*43*	*50*	*60*	*60*
018.	Indiana University-Bloomington	22	40	68	.10	13.0	.73	.27
	Music	*51*	*56*	*58*	*47*	*35*	*57*	*53*
019.	Iowa, University of-Iowa City	24	128	120	.08	11.1	.75	.20
	Music	*52*	*91*	*75*	*45*	*44*	*59*	*47*
020.	Julliard School	12	45	41	.08	6.1	.55	.26
	Graduate Division	*45*	*58*	*50*	*45*	*69*	*43*	*52*

* indicates program was initiated since 1970.

NOTE: On the first line of data for every program, raw values for each measure are reported; on the second line values are reported in standardized form, with mean = 50 and standard deviation = 10. "NA" indicates that the value for a measure is not available.

TABLE 9.1 Program Measures (Raw and Standardized Values) in Music

Prog No.	Survey Results				University Library	Survey Ratings Standard Error			
	(08)	(09)	(10)	(11)	(12)	(08)	(09)	(10)	(11)
001.	1.7	1.0	1.2	0.6	NA	.19	.12	.09	.08
	39	*40*	*57*	*39*					
002.	2.4	1.2	1.1	0.7	-0.4	.18	.13	.09	.09
	46	*43*	*52*	*44*	*40*				
003.	3.6	1.9	0.8	1.0	NA	.12	.09	.10	.10
	58	*56*	*39*	*51*					
004.	4.0	2.0	1.1	1.3	NA	.12	.09	.07	.09
	62	*59*	*55*	*58*					
005.	4.5	2.6	1.2	1.4	2.2	.10	.08	.07	.09
	67	*69*	*57*	*63*	*68*				
006.	3.8	2.1	1.1	1.4	2.0	.11	.09	.09	.08
	60	*60*	*54*	*62*	*65*				
007.	1.9	1.1	1.1	0.6	-0.0	.24	.16	.13	.09
	41	*42*	*51*	*39*	*44*				
008.	2.6	1.4	1.3	0.9	-0.1	.14	.13	.14	.08
	48	*48*	*62*	*49*	*43*				
009.	1.9	1.1	0.9	0.8	-1.3	.19	.13	.12	.09
	41	*42*	*43*	*44*	*30*				
010.	2.0	1.1	0.9	0.8	NA	.19	.13	.05	.08
	42	*41*	*43*	*45*					
011.	4.5	2.6	1.0	1.3	0.9	.11	.08	.08	.10
	67	*68*	*49*	*58*	*53*				
012.	2.1	1.2	1.0	0.7	-0.2	.17	.13	.16	.08
	43	*43*	*47*	*41*	*41*				
013.	2.0	1.1	1.0	0.6	-0.9	.16	.11	.13	.08
	42	*42*	*47*	*40*	*35*				
014.	3.9	2.3	0.9	1.2	1.7	.10	.08	.12	.10
	61	*63*	*40*	*57*	*63*				
015.	4.0	2.3	1.1	1.3	1.6	.11	.08	.10	.09
	62	*64*	*50*	*58*	*61*				
016.	2.5	1.5	1.3	0.9	-0.4	.22	.13	.12	.09
	47	*49*	*65*	*49*	*39*				
017.	4.1	2.2	1.1	1.6	2.0	.10	.08	.07	.08
	63	*62*	*53*	*67*	*65*				
018.	3.7	2.0	1.1	1.5	0.9	.11	.09	.09	.07
	59	*58*	*51*	*66*	*54*				
019.	3.0	1.8	1.0	1.1	0.3	.12	.08	.10	.09
	52	*54*	*47*	*53*	*47*				
020.	2.9	1.3	0.9	1.2	NA	.23	.14	.09	.08
	51	*45*	*44*	*58*					

NOTE: On the first line of data for every program, raw values for each measure are reported; on the second line values are reported in standardized form, with mean = 50 and standard deviation = 10. "NA" indicates that the value for a measure is not available.

TABLE 9.1 Program Measures (Raw and Standardized Values) in Music

Prog No.	University - Department/Academic Unit	Program Size			Characteristics of Program Graduates			
		(01)	(02)	(03)	(04)	(05)	(06)	(07)
021.	Kansas, University of	18	1	34	.00	10.0	.73	.36
	Fine Arts	*49*	*40*	*47*	*37*	*50*	*57*	*61*
022.	Kentucky, University of	17	11	19	NA	NA	NA	NA
	Music	*48*	*44*	*42*				
023.	Louisiana State University-Baton Rouge	3	17	22	.20	10.3	.80	.50
	Music	*39*	*46*	*43*	*58*	*49*	*63*	*72*
024.	Maryland, University of-College Park	29	21	76	.16	9.5	.71	.21
	Music	*55*	*48*	*61*	*54*	*52*	*56*	*48*
025.	Miami, University of-Florida	30	14	20	.11	5.5	.65	.12
	Music	*56*	*45*	*43*	*49*	*72*	*51*	*40*
026.	Michigan State University-East Lansing	19	38	36	.04	9.1	.61	.13
	Music	*49*	*55*	*48*	*42*	*54*	*48*	*41*
027.	Michigan, University of-Ann Arbor	92	108	133	.11	8.6	.61	.20
	Music	*95*	*83*	*79*	*49*	*57*	*48*	*47*
028.	Minnesota, University of	14	21	36	.05	12.5	.71	.19
	Music	*46*	*48*	*48*	*42*	*37*	*56*	*46*
029.	Missouri, University of-Kansas City	12	26	116	.13	12.0	.75	.33
	Music	*45*	*50*	*74*	*50*	*40*	*59*	*58*
030.	New York University	10	18	25	.15	12.5	.40	.08
	Music	*43*	*47*	*44*	*53*	*37*	*31*	*37*
031.	North Carolina, University of-Chapel Hill	6	17	25	.26	8.0	.53	.21
	Music	*41*	*46*	*44*	*65*	*60*	*41*	*48*
032.	North Texas State University-Denton	18	18	57	.10	10.1	.65	.16
	Music	*49*	*47*	*55*	*47*	*49*	*51*	*43*
033.	Northwestern University	19	28	17	.00	11.4	.78	.19
	Music	*49*	*51*	*42*	*37*	*43*	*62*	*46*
034.	Ohio State University-Columbus	39	62	96	.17	7.6	.61	.17
	Music	*62*	*65*	*67*	*55*	*62*	*48*	*45*
035.	Oklahoma, University of-Norman	34	29	62	.00	NA	.60	.30
	Music	*59*	*51*	*56*	*37*		*47*	*55*
036.	Oregon, University of-Eugene	13	30	34	.16	11.8	.76	.16
	Music	*45*	*52*	*47*	*54*	*41*	*60*	*44*
037.	Peabody Institute of Johns Hopkins Univ	67	27	40	.04	13.0	.78	.30
	Peabody Conservatory of Music	*79*	*50*	*49*	*42*	*35*	*61*	*56*
038.	Pennsylvania, University of	15	9	30	NA	NA	NA	NA
	Music	*47*	*43*	*46*				
039.	Pittsburgh, University of	9	9	16	.21	11.0	.43	.07
	Music	*43*	*43*	*41*	*60*	*45*	*34*	*36*
040.	Princeton University	9	29	33	.33	8.0	.63	.46
	Music	*43*	*51*	*47*	*72*	*60*	*49*	*69*

* indicates program was initiated since 1970.

NOTE: On the first line of data for every program, raw values for each measure are reported; on the second line values are reported in standardized form, with mean = 50 and standard deviation = 10. "NA" indicates that the value for a measure is not available.

TABLE 9.1 Program Measures (Raw and Standardized Values) in Music

Prog No.	Survey Results				University Library	Survey Ratings Standard Error			
	(08)	(09)	(10)	(11)	(12)	(08)	(09)	(10)	(11)
021.	2.3	1.2	1.1	0.8	0.1	.19	.14	.14	.09
	45	*43*	*53*	*44*	*45*				
022.	1.9	1.0	0.9	0.8	-0.1	.15	.12	.12	.08
	41	*40*	*43*	*44*	*43*				
023.	0.8	0.6	NA	0.3	-0.3	.20	.12	NA	.08
	30	*32*		*32*	*40*				
024.	2.6	1.5	1.2	1.0	0.2	.12	.08	.08	.08
	48	*49*	*57*	*51*	*46*				
025.	1.4	0.8	NA	0.5	NA	.19	.15	NA	.08
	36	*37*		*38*					
026.	1.8	1.2	0.6	0.6	0.3	.20	.12	.11	.08
	40	*44*	*28*	*40*	*48*				
027.	4.0	2.2	1.0	1.5	1.8	.10	.07	.10	.08
	62	*62*	*50*	*65*	*63*				
028.	2.6	1.4	1.2	0.9	1.2	.15	.10	.12	.08
	48	*48*	*55*	*49*	*56*				
029.	1.2	0.8	1.0	0.5	NA	.18	.13	.09	.08
	34	*36*	*47*	*37*					
030.	3.8	2.1	0.9	1.2	0.5	.11	.07	.11	.09
	60	*60*	*42*	*57*	*49*				
031.	3.8	2.1	1.3	1.2	1.0	.10	.09	.11	.10
	60	*60*	*61*	*57*	*54*				
032.	2.8	1.6	1.2	1.2	NA	.10	.08	.08	.07
	50	*51*	*60*	*57*					
033.	3.0	1.6	1.2	1.1	0.3	.13	.09	.11	.08
	52	*51*	*57*	*55*	*47*				
034.	2.9	1.6	0.9	1.1	0.9	.10	.09	.11	.08
	51	*51*	*44*	*52*	*53*				
035.	1.4	1.0	0.9	0.5	-0.6	.18	.12	.11	.08
	36	*39*	*44*	*38*	*38*				
036.	2.1	1.2	1.1	0.5	-0.9	.16	.13	.12	.08
	43	*42*	*54*	*38*	*34*				
037.	2.2	1.2	1.1	0.6	NA	.25	.16	.12	.08
	44	*44*	*50*	*40*					
038.	4.0	2.2	1.5	1.4	0.7	.12	.08	.08	.08
	62	*61*	*73*	*62*	*51*				
039.	2.1	1.3	0.9	0.6	0.1	.15	.11	.14	.08
	43	*44*	*43*	*41*	*45*				
040.	4.5	2.6	0.7	1.5	0.9	.09	.08	.10	.08
	67	*68*	*30*	*66*	*53*				

NOTE: On the first line of data for every program, raw values for each measure are reported; on the second line values are reported in standardized form, with mean = 50 and standard deviation = 10. "NA" indicates that the value for a measure is not available.

TABLE 9.1 Program Measures (Raw and Standardized Values) in Music

Prog No.	University - Department/Academic Unit	Program Size (01)	(02)	(03)	Characteristics of Program Graduates (04)	(05)	(06)	(07)
041.	Rochester, University of	20	26	34	.19	9.5	.77	.31
	Eastman School of Music	*50*	*50*	*47*	*57*	*52*	*61*	*56*
042.	Rutgers, The State University-New Brunswick	13	12	38	NA	NA	NA	NA
	Music	*45*	*44*	*49*				
043.	SUNY at Buffalo	19	16	23	.00	7.2	.31	.08
	Music	*49*	*46*	*44*	*37*	*64*	*24*	*37*
044.	Southern California, University of	48	81	67	.14	12.8	.57	.11
	Music	*67*	*72*	*58*	*51*	*36*	*45*	*39*
045.	Southwestern Baptist Theological Seminary	15	15	29	.00	8.5	.82	.09
	Music History and Literature	*47*	*45*	*46*	*37*	*57*	*64*	*38*
046.	Stanford University	13	13	50	.10	8.8	.54	.36
	Music	*45*	*45*	*52*	*48*	*56*	*42*	*60*
047.	Texas, University of-Austin	19	20	38	.02	12.2	.80	.41
	Music	*49*	*48*	*49*	*39*	*39*	*63*	*65*
048.	Washington University-Saint Louis	7	11	36	.33	9.2	.41	.12
	Musicology/ Music Education/ Theory	*42*	*44*	*48*	*72*	*54*	*32*	*40*
049.	Washington, University of-Seattle	29	84	40	.18	10.3	.65	.14
	Music	*55*	*74*	*49*	*56*	*49*	*51*	*42*
050.	Wesleyan University	8	14	10	.06	7.5	.57	.29
	Arts and Humanities	*42*	*45*	*40*	*43*	*62*	*45*	*54*
051.	West Virginia University	20	21	7	.16	10.6	.71	.06
	Music	*50*	*48*	*39*	*54*	*47*	*55*	*35*
052.	Wisconsin, University of-Madison	14	5	9	.26	11.0	.67	.38
	Music	*46*	*41*	*39*	*65*	*45*	*52*	*62*
053.	Yale University	11	23	52	.32	6.4	.72	.40
	Music	*44*	*49*	*53*	*71*	*68*	*57*	*64*

* indicates program was initiated since 1970.

NOTE: On the first line of data for every program, raw values for each measure are reported; on the second line values are reported in standardized form, with mean = 50 and standard deviation = 10. "NA" indicates that the value for a measure is not available.

TABLE 9.1 Program Measures (Raw and Standardized Values) in Music

Prog	Survey Results				University Library	Survey Ratings Standard Error			
No.	(08)	(09)	(10)	(11)	(12)	(08)	(09)	(10)	(11)
041.	3.6	2.0	1.6	1.4	-0.6	.12	.09	.10	.10
	58	*58*	*80*	*61*	*37*				
042.	3.1	1.7	0.8	1.0	0.8	.12	.09	.10	.09
	53	*52*	*39*	*50*	*52*				
043.	3.1	1.5	1.0	1.0	0.3	.11	.09	.09	.08
	53	*48*	*46*	*51*	*47*				
044.	3.0	1.7	1.2	0.9	0.4	.15	.11	.08	.08
	52	*52*	*59*	*49*	*48*				
045.	0.5	0.2	NA	0.1	NA	.13	.11	NA	.05
	27	*25*		*27*					
046.	3.7	2.2	1.0	1.2	2.0	.09	.09	.06	.09
	59	*61*	*46*	*57*	*66*				
047.	3.2	1.7	1.2	1.3	1.6	.11	.09	.10	.08
	54	*52*	*55*	*59*	*61*				
048.	1.8	1.0	0.7	0.5	-0.4	.20	.15	.19	.08
	40	*40*	*30*	*37*	*40*				
049.	2.8	1.5	1.2	0.9	1.5	.15	.11	.11	.09
	50	*49*	*60*	*48*	*59*				
050.	2.7	1.5	0.8	0.7	NA	.23	.13	.12	.09
	49	*49*	*34*	*43*					
051.	1.7	1.0	1.2	0.5	NA	.18	.12	.11	.08
	39	*39*	*60*	*37*					
052.	2.6	1.4	0.9	1.1	1.6	.13	.12	.10	.08
	48	*46*	*42*	*55*	*61*				
053.	4.4	2.5	1.0	1.6	2.1	.10	.09	.08	.08
	66	*67*	*50*	*68*	*66*				

NOTE: On the first line of data for every program, raw values for each measure are reported; on the second line values are reported in standardized form, with mean = 50 and standard deviation = 10. "NA" indicates that the value for a measure is not available.

TABLE 9.2 Summary Statistics Describing Each Program Measure--Music

Measure	Number of Programs Evaluated	Mean	Standard Deviation	DECILES 1	2	3	4	5	6	7	8	9
Program Size												
01 Raw Value	53	20	16	7	10	12	13	15	19	19	27	38
Std Value	53	50	10	42	43	45	45	47	49	49	54	61
02 Raw Value	53	26	25	9	11	13	16	18	21	26	29	44
Std Value	53	50	10	43	44	45	46	47	48	50	51	57
03 Raw Value	53	42	31	11	19	25	31	34	38	41	59	76
Std Value	53	50	10	40	42	44	46	47	49	50	55	61
Program Graduates												
04 Raw Value	49	.12	.09	.00	.03	.05	.08	.11	.14	.16	.19	.26
Std Value	49	50	10	37	40	42	46	49	52	54	58	66
05 Raw Value	48	10.0	2.0	12.8	11.9	11.0	10.5	10.1	9.5	9.1	8.0	7.3
Std Value	48	50	10	36	40	45	47	49	52	54	60	63
06 Raw Value	48	.64	.13	.43	.53	.57	.61	.65	.70	.72	.75	.78
Std Value	48	50	10	34	42	45	48	51	55	56	58	61
07 Raw Value	48	.24	.12	.09	.13	.16	.19	.21	.25	.28	.32	.39
Std Value	48	50	10	38	41	43	46	48	51	53	57	63
Survey Results												
08 Raw Value	53	2.8	1.0	1.5	1.9	2.1	2.5	2.7	3.0	3.6	3.8	4.0
Std Value	53	50	10	37	41	43	47	49	52	58	60	62
09 Raw Value	53	1.6	.6	1.0	1.1	1.2	1.3	1.5	1.6	1.9	2.1	2.2
Std Value	53	50	10	40	42	43	45	49	51	56	60	62
10 Raw Value	50	1.1	.2	.8	.9	.9	1.0	1.0	1.1	1.1	1.2	1.2
Std Value	50	50	10	37	42	42	47	47	53	53	58	58
11 Raw Value	53	1.0	.4	.5	.6	.7	.8	1.0	1.1	1.2	1.3	1.4
Std Value	53	50	10	37	40	43	45	51	54	56	59	62
University Library												
12 Raw Value	41	.6	.9	-.6	-.4	-.1	.2	.4	.8	1.0	1.6	1.9
Std Value	41	50	10	37	40	43	46	48	52	55	61	64

NOTE: Standardized values reported in the preceding table have been computed from exact values of the mean and standard deviation and not the rounded values reported here.

TABLE 9.3 Intercorrelations Among Program Measures on 53 Programs in Music

	Measure											
	01	02	03	04	05	06	07	08	09	10	11	12
Program Size												
01		.54	.44	-.21	-.07	.15	-.18	-.02	-.02	.17	.01	.11
02			.61	-.02	-.03	.12	-.17	.12	.13	.08	.17	.12
03				.06	-.03	.11	.03	.17	.21	.12	.25	.18
Program Graduates												
04					.21	-.20	.21	.44	.46	-.08	.35	.26
05						-.26	.05	.17	.16	-.13	.14	.34
06							.46	-.26	-.23	.33	-.14	-.06
07								.28	.30	-.04	.30	.24
Survey Results												
08									.99	.16	.94	.73
09										.14	.91	.72
10											.23	-.01
11												.74
University Library												
12												

NOTE: Since in computing correlation coefficients program data must be available for both of the measures being correlated, the actual number of programs on which each coefficient is based varies.

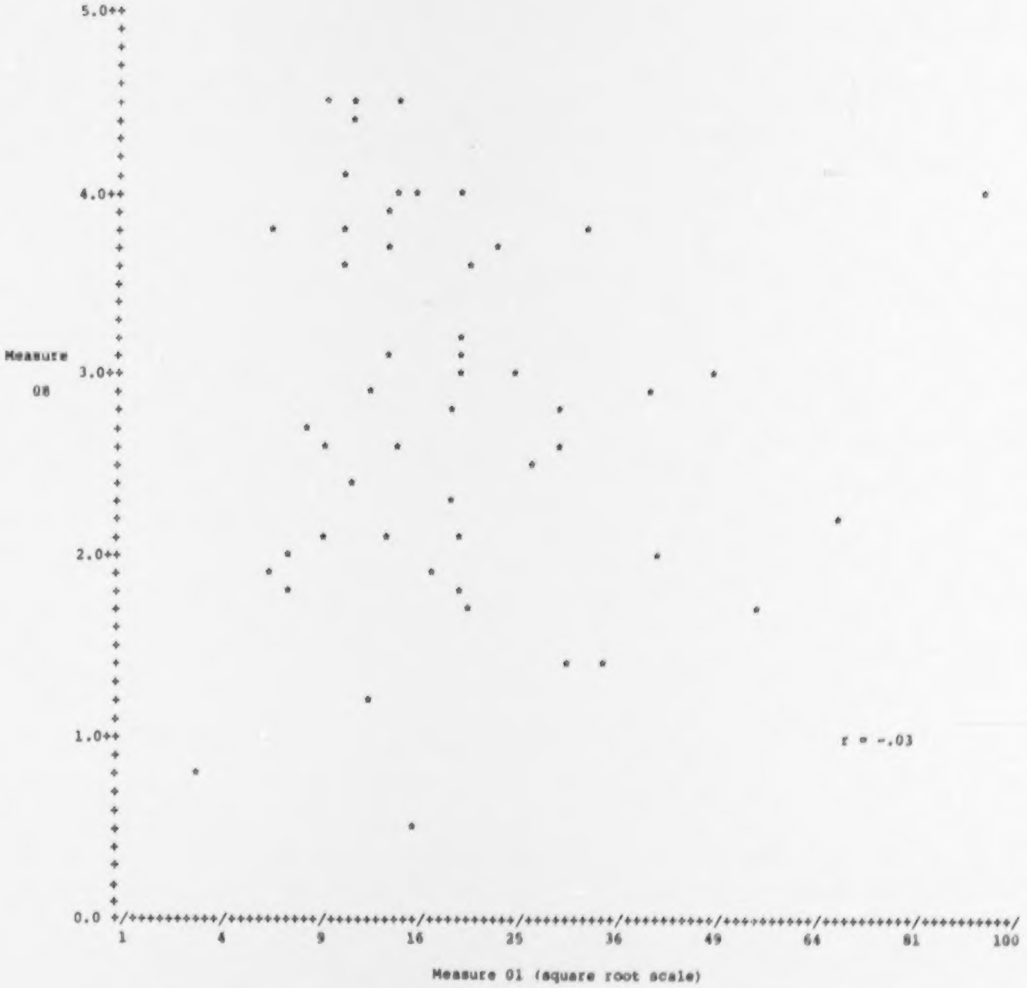

FIGURE 9.1 Mean rating of scholarly quality of faculty (measure 08) versus number of faculty members (measure 01)--53 programs in music.

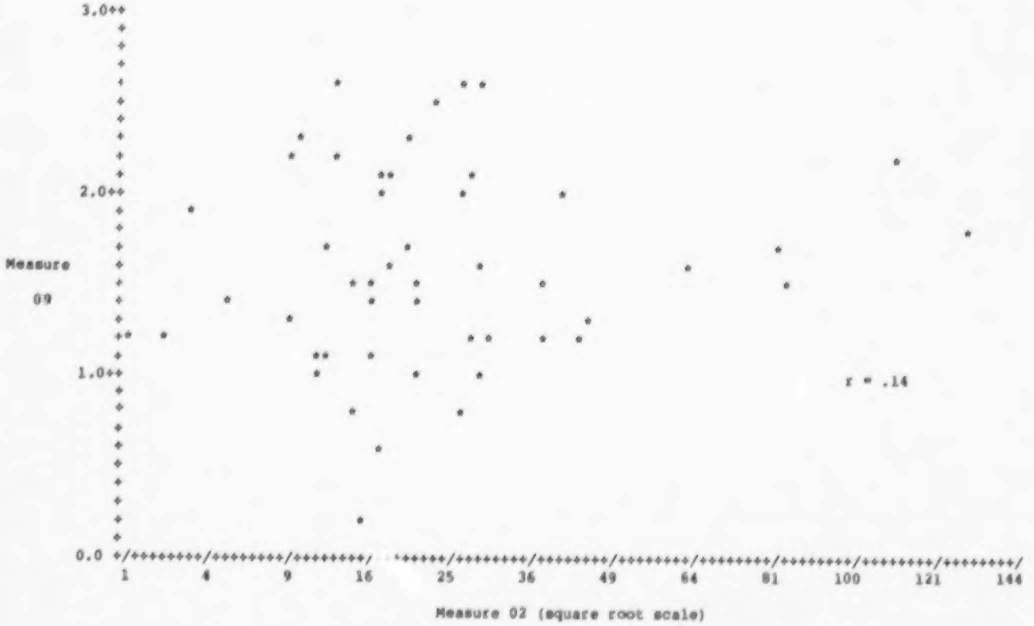

FIGURE 9.2 Mean rating of program effectiveness in educating research scholars/scientists (measure 09) versus number of graduates in last five years (measure 02)--53 programs in music.

TABLE 9.4 Characteristics of Survey Participants in Music

	Respondents	
	N	%
Field of Specialization		
Musicology	35	51
Music Theory & Composition	13	19
Other/Unknown	21	30
Faculty Rank		
Professor	34	49
Associate Professor	22	32
Assistant Professor	9	13
Other/Unknown	4	6
Year of Highest Degree		
Pre-1950	2	3
1950-59	15	22
1960-69	27	39
Post-1969	24	35
Unknown	1	1
Evaluator Selection		
Nominated by Institution	60	87
Other	9	13
Survey Form		
With Faculty Names	61	88
Without Names	8	12
Total Evaluators	69	100

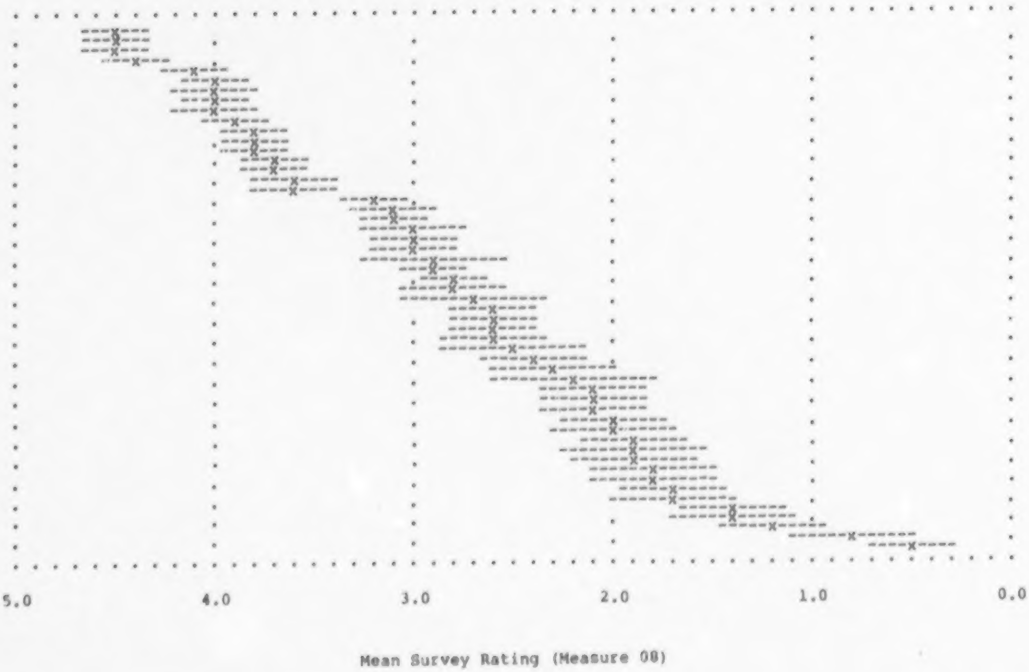

FIGURE 9.3 Mean rating of scholarly quality of faculty in 53 programs in music.

NOTE: Programs are listed in sequence of mean rating, with the highest-rated program appearing at the top of the page. The broken lines (---) indicate a confidence interval of ±1.5 standard errors around the reported mean (x) of each program.

X

Philosophy Programs

In this chapter 77 research-doctorate programs in philosophy are assessed. These programs, according to the information supplied by their universities, have accounted for 1,395 doctoral degrees awarded during the FY1976-80 period--approximately 91 percent of the aggregate number of philosophy doctorates earned from U.S. universities in this five-year span.[1] On the average, 29 full-time and part-time students intending to earn doctorates were enrolled in a program in December 1980, with an average faculty size of 14 members.[2] Only three of the programs were initiated since 1970; and only the University of Pittsburgh had more than one program included in the assessment in this discipline. In addition to the 76 institutions represented in this discipline, another 7 were initially identified as meeting the criteria[3] for inclusion in the assessment:

Brandeis University
New York University
Rockefeller University
Southern Baptist Theological
  Seminary--Kentucky
SUNY at Binghamton
Duquesne University
U.S. International University

The latter two institutions chose not to participate in the assessment in any discipline. Philosophy programs at the other five institutions have not been included in the evaluations in this discipline, since in each case the study coordinator either indicated that the institution did not at that time have a research-doctorate program in philosophy or failed to provide the information requested by the committee.

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[1] Data from the NRC's Survey of Earned Doctorates indicate that 1,531 research doctorates in philosophy were awarded by U.S. universities between FY1976 and FY1980.

[2] See the reported means for measures 03 and 01 in Table 10.2.

[3] As mentioned in Chapter I, the primary criterion for inclusion was that a university had awarded at least 6 doctorates in philosophy during the FY1976-78 period.

Before examining individual program results presented in Table 10.1, the reader is urged to refer to Chapter II, in which each of the 12 measures used in the assessment is discussed. Summary statistics describing every measure are given in Table 10.2. For seven of the measures, data are reported for at least 76 of the 77 philosophy programs. For measures 04-07, which pertain to characteristics of the program graduates, data are presented for approximately three-fourths of the programs; the other fourth had too few graduates on which to base statistics.[4] For measure 12, a composite index of the size of a university library, data are available for 64 programs. The programs not evaluated on measure 12 are typically smaller--in terms of faculty size and graduate student enrollment--than other philosophy programs. Were data on this measure available for all 77 programs, it is likely that the reported mean would be appreciably lower (and that some of the correlations of this measure with others would be higher).

Intercorrelations among the 12 measures (Pearson product-moment coefficients) are given in Table 10.3. Of particular note are the high positive correlations of the fraction of program graduates intending to take positions in Ph.D.-granting institutions (measure 07) with reputational survey ratings (08, 09). Figure 10.1 illustrates the relation between the mean rating of the scholarly quality of faculty (measure 08) and the number of faculty members (measure 01) for each of 77 programs in philosophy. Figure 10.2 plots the mean rating of program effectiveness (measure 09) against the total number of FY1976-80 program graduates (measure 02). Although in both figures there is a significant positive correlation between program size and reputational rating, it is quite apparent that some of the smaller programs received high mean ratings and that some of the larger programs received low mean ratings.

Table 10.4 describes the 157 faculty members who participated in the evaluation of philosophy programs. These individuals constituted 68 percent of those asked to respond to the survey in this discipline and 14 percent of the faculty population in the 77 research-doctorate programs being evaluated.[5] Approximately one-fourth of the survey participants had earned their highest degree since 1970, and a majority were full professors.

To assist the reader in interpreting results of the survey evaluations, estimated standard errors have been computed for mean ratings of the scholarly quality of faculty in 77 philosophy programs (and are given in Table 10.1). For each program the mean rating and an associated "confidence interval" of 1.5 standard errors are illustrated in

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[4] As mentioned in Chapter II, data for measures 04-07 are not reported if they are based on the survey responses of fewer than 10 FY1975-79 program graduates.

[5] See Table 2.3 in Chapter II.

Figure 10.3 (listed in order of highest to lowest mean rating). In comparing two programs, if their confidence intervals do not overlap, one may conclude that there is a significant difference in their mean ratings at a .05 level of significance.[6] From this figure it is also apparent that one should have somewhat more confidence in the accuracy of the mean ratings of higher-rated programs than lower-rated programs. This generalization results primarily from the fact that evaluators are not as likely to be familiar with the less prestigious programs, and consequently the mean ratings of these programs are usually based on fewer survey responses.

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[6] See pp. 28-30 for a discussion of the interpretation of mean ratings and associated confidence intervals.

TABLE 10.1 Program Measures (Raw and Standardized Values) in Philosophy

Prog No.	University - Department/Academic Unit	Program Size			Characteristics of Program Graduates			
		(01)	(02)	(03)	(04)	(05)	(06)	(07)
001.	Arizona, University of-Tucson	15	7	23	NA	NA	NA	NA
	Philosophy	*52*	*39*	*46*				
002.	Boston College	19	31	47	.11	7.2	.47	.17
	Philosophy	*60*	*63*	*62*	*38*	*54*	*45*	*45*
003.	Boston University	20	33	46	.22	7.8	.53	.22
	Philosophy	*62*	*65*	*61*	*46*	*51*	*48*	*49*
004.	Brown University	12	20	32	.15	5.2	.40	.10
	Philosophy	*46*	*52*	*52*	*41*	*66*	*41*	*41*
005.	Bryn Mawr College	7	9	12	NA	NA	NA	NA
	Philosophy	*36*	*41*	*39*				
006.	CUNY-Graduate School	18	34	48	.03	8.9	.41	.24
	Philosophy	*58*	*66*	*63*	*33*	*44*	*41*	*50*
007.	California, University of-Berkeley	21	33	35	.22	7.8	.74	.52
	Philosophy	*64*	*65*	*54*	*46*	*50*	*60*	*66*
008.	California, University of-Irvine	13	11	22	.42	8.8	.33	.08
	Philosophy	*48*	*43*	*46*	*60*	*44*	*37*	*40*
009.	California, University of-Los Angeles	18	24	51	.35	9.0	.43	.29
	Philosophy	*58*	*56*	*65*	*55*	*43*	*42*	*52*
010.	California, University of-Riverside	6	8	4	NA	NA	NA	NA
	*Philosophy**	*34*	*40*	*34*				
011.	California, University of-San Diego	13	8	31	NA	NA	NA	NA
	Philosophy	*48*	*40*	*52*				
012.	California, University of-Santa Barbara	11	12	20	.25	7.1	.50	.25
	Philosophy	*44*	*44*	*44*	*48*	*55*	*46*	*50*
013.	Catholic University of America	18	19	22	.09	14.5	.90	.00
	Philosophy	*58*	*51*	*46*	*37*	*9*	*69*	*36*
014.	Chicago, University of	18	27	32	.29	7.6	.47	.18
	Philosophy	*58*	*59*	*52*	*51*	*52*	*45*	*46*
015.	Cincinnati, University of	14	4	10	NA	NA	NA	NA
	Philosophy	*50*	*36*	*38*				
016.	Claremont Graduate School	13	10	36	.55	10.7	.50	.00
	Philosophy	*48*	*42*	*55*	*69*	*33*	*46*	*36*
017.	Colorado, University of	26	13	27	.23	10.8	.33	.08
	Philosophy	*74*	*45*	*49*	*47*	*32*	*37*	*40*
018.	Columbia University	14	26	96	.25	8.9	.50	.25
	Philosophy	*50*	*58*	*94*	*48*	*43*	*46*	*50*
019.	Connecticut, University of-Storrs	10	8	11	NA	NA	NA	NA
	Philosophy	*42*	*40*	*39*				
020.	Cornell University-Ithaca	13	25	17	.20	6.4	.68	.36
	Philosophy	*48*	*57*	*42*	*45*	*59*	*56*	*57*

* indicates program was initiated since 1970.

NOTE: On the first line of data for every program, raw values for each measure are reported; on the second line values are reported in standardized form, with mean = 50 and standard deviation = 10. "NA" indicates that the value for a measure is not available.

TABLE 10.1 Program Measures (Raw and Standardized Values) in Philosophy

Prog No.	Survey Results (08)	(09)	(10)	(11)	University Library (12)	Survey Ratings Standard Error (08)	(09)	(10)	(11)
001.	3.6	1.7	1.7	1.6	0.9	.08	.09	.07	.06
	61	*55*	*71*	*63*	*56*				
002.	1.6	1.3	0.9	0.4	NA	.18	.15	.11	.06
	40	*47*	*45*	*33*					
003.	3.2	1.8	1.2	1.5	-0.4	.10	.09	.05	.05
	56	*56*	*56*	*62*	*44*				
004.	3.6	2.1	1.0	1.6	-1.1	.08	.06	.04	.06
	60	*62*	*48*	*63*	*37*				
005.	1.5	1.0	0.9	0.7	NA	.13	.12	.05	.06
	40	*41*	*44*	*40*					
006.	3.2	1.5	1.2	1.4	NA	.08	.10	.07	.06
	56	*50*	*54*	*58*					
007.	4.5	2.3	1.3	1.7	2.2	.07	.07	.06	.06
	69	*65*	*58*	*66*	*69*				
008.	3.1	1.9	1.6	1.3	NA	.08	.08	.07	.07
	55	*57*	*68*	*57*					
009.	4.4	2.3	1.2	1.7	2.0	.07	.07	.05	.06
	68	*66*	*55*	*65*	*67*				
010.	1.4	0.7	0.9	0.8	-1.0	.10	.10	.07	.06
	38	*36*	*44*	*44*	*37*				
011.	2.6	1.6	1.1	1.1	-0.0	.09	.08	.08	.06
	50	*52*	*52*	*50*	*47*				
012.	2.3	1.3	1.1	1.0	-0.1	.10	.10	.08	.07
	47	*46*	*52*	*48*	*46*				
013.	2.4	1.6	1.2	0.9	NA	.15	.13	.06	.07
	49	*52*	*53*	*46*					
014.	4.3	2.2	1.5	1.7	0.9	.07	.07	.07	.05
	67	*63*	*64*	*67*	*56*				
015.	1.9	0.9	1.2	0.6	-0.2	.11	.12	.05	.06
	43	*39*	*53*	*40*	*45*				
016.	2.1	1.2	1.1	0.8	NA	.11	.11	.04	.06
	45	*46*	*50*	*43*					
017.	1.9	1.1	0.9	0.7	-0.9	.11	.10	.06	.06
	44	*43*	*45*	*41*	*39*				
018.	3.5	2.0	0.7	1.5	1.7	.09	.07	.06	.06
	60	*59*	*38*	*61*	*65*				
019.	1.8	1.0	1.1	0.8	-0.5	.11	.11	.06	.06
	42	*42*	*51*	*43*	*42*				
020.	3.8	2.2	0.8	1.6	1.6	.09	.08	.07	.06
	62	*63*	*40*	*63*	*63*				

NOTE: On the first line of data for every program, raw values for each measure are reported; on the second line values are reported in standardized form, with mean = 50 and standard deviation = 10. "NA" indicates that the value for a measure is not available.

TABLE 10.1 Program Measures (Raw and Standardized Values) in Philosophy

Prog No.	University - Department/Academic Unit	Program Size (01)	Program Size (02)	Program Size (03)	Characteristics of Program Graduates (04)	Characteristics of Program Graduates (05)	Characteristics of Program Graduates (06)	Characteristics of Program Graduates (07)
021.	Depaul University	11	14	47	NA	NA	NA	NA
	Philosophy	*44*	*46*	*62*				
022.	Duke University	9	5	15	NA	NA	NA	NA
	Philosophy	*40*	*37*	*41*				
023.	Emory University	8	7	20	NA	NA	NA	NA
	Philosophy	*38*	*39*	*44*				
024.	Florida State University-Tallahassee	8	12	18	.36	7.8	.69	.15
	Philosophy	*38*	*44*	*43*	*56*	*50*	*57*	*45*
025.	Fordham University	22	27	50	.15	9.8	.46	.08
	Philosophy	*66*	*59*	*64*	*41*	*38*	*44*	*40*
026.	Georgetown University	18	18	50	.38	9.0	.50	.20
	Philosophy	*58*	*50*	*64*	*57*	*43*	*46*	*47*
027.	Georgia, University of-Athens	8	9	10	NA	NA	NA	NA
	*Philosophy and Religion**	*38*	*41*	*38*				
028.	Harvard University	13	33	28	.41	7.5	.94	.56
	Philosophy	*48*	*65*	*50*	*59*	*52*	*71*	*68*
029.	Hawaii, University of	14	13	42	NA	NA	NA	NA
	Philosophy	*50*	*45*	*59*				
030.	Illinois, University of-Chicago Circle	17	10	24	NA	NA	NA	NA
	Philosophy	*56*	*42*	*47*				
031.	Illinois, University-Urbana/Champaign	17	12	27	.09	7.8	.40	.20
	Philosophy	*56*	*44*	*49*	*37*	*51*	*41*	*47*
032.	Indiana University-Bloomington	13	13	36	NA	NA	NA	NA
	Philosophy	*48*	*45*	*55*				
033.	Iowa, University of-Iowa City	8	12	15	.00	5.7	.23	.00
	Philosophy	*38*	*44*	*41*	*31*	*64*	*31*	*36*
034.	Johns Hopkins University	5	18	22	.24	6.4	.81	.56
	Philosophy	*32*	*50*	*46*	*47*	*59*	*64*	*68*
035.	Kansas, University of	13	13	23	.46	9.0	.39	.00
	Philosophy	*48*	*45*	*46*	*63*	*43*	*40*	*36*
036.	Marquette University	24	15	24	.40	9.8	.53	.00
	Philosophy	*70*	*47*	*47*	*59*	*38*	*48*	*36*
037.	Massachusetts Institute of Technology	13	12	25	.54	7.5	.69	.46
	Linguistics and Philosophy	*48*	*44*	*48*	*68*	*52*	*57*	*63*
038.	Massachusetts, University of-Amherst	12	20	43	.25	5.5	.79	.50
	Philosophy	*46*	*52*	*59*	*48*	*65*	*63*	*65*
039.	Miami, University of-Florida	8	9	12	NA	NA	NA	NA
	Philosophy	*38*	*41*	*39*				
040.	Michigan State University-East Lansing	24	12	21	.20	10.3	.53	.20
	Philosophy	*70*	*44*	*45*	*45*	*35*	*48*	*47*

* indicates program was initiated since 1970.

NOTE: On the first line of data for every program, raw values for each measure are reported; on the second line values are reported in standardized form, with mean = 50 and standard deviation = 10. "NA" indicates that the value for a measure is not available.

TABLE 10.1 Program Measures (Raw and Standardized Values) in Philosophy

Prog	Survey Results				University Library	Survey Ratings Standard Error			
No.	(08)	(09)	(10)	(11)	(12)	(08)	(09)	(10)	(11)
021.	1.2	0.7	NA	0.3	NA	.15	.12	NA	.05
	36	*35*		*32*					
022.	2.1	1.1	1.0	0.9	0.3	.10	.10	.08	.07
	46	*43*	*47*	*45*	*51*				
023.	1.6	0.9	0.9	0.8	-0.6	.12	.12	.06	.06
	41	*40*	*45*	*44*	*41*				
024.	2.2	1.2	1.9	1.0	-0.4	.12	.13	.04	.07
	46	*44*	*78*	*48*	*43*				
025.	2.3	1.4	1.1	0.6	NA	.15	.13	.07	.07
	47	*49*	*53*	*39*					
026.	2.0	1.4	1.2	0.8	-0.6	.13	.11	.11	.07
	45	*48*	*55*	*44*	*41*				
027.	1.2	0.7	1.0	0.6	0.4	.10	.11	.10	.06
	36	*35*	*49*	*38*	*52*				
028.	4.7	2.5	0.7	1.8	3.0	.06	.06	.06	.04
	72	*70*	*37*	*70*	*77*				
029.	1.7	1.1	1.1	0.7	-0.1	.13	.14	.06	.07
	41	*42*	*52*	*41*	*46*				
030.	3.3	1.9	1.5	1.3	NA	.08	.06	.07	.07
	58	*58*	*63*	*57*					
031.	2.7	1.6	0.8	1.1	2.0	.09	.08	.06	.07
	51	*52*	*40*	*50*	*67*				
032.	3.3	2.0	1.1	1.4	0.9	.08	.07	.04	.07
	58	*59*	*51*	*58*	*57*				
033.	2.3	1.5	0.6	0.8	0.3	.11	.10	.08	.07
	47	*51*	*35*	*45*	*50*				
034.	2.8	1.7	0.5	1.3	-0.4	.08	.08	.07	.07
	52	*54*	*32*	*56*	*43*				
035.	1.7	1.2	1.1	0.6	0.1	.12	.12	.06	.07
	42	*45*	*52*	*39*	*48*				
036.	1.6	1.1	1.1	0.4	NA	.15	.15	.08	.06
	40	*43*	*50*	*33*					
037.	4.0	2.2	1.3	1.5	-0.3	.07	.06	.06	.06
	64	*63*	*58*	*62*	*44*				
038.	3.5	2.1	1.2	1.4	-0.7	.08	.07	.06	.07
	60	*62*	*53*	*60*	*40*				
039.	1.6	0.9	1.3	0.8	NA	.11	.12	.09	.07
	41	*38*	*58*	*43*					
040.	1.8	1.1	0.8	0.7	0.3	.11	.11	.07	.06
	43	*44*	*41*	*41*	*51*				

NOTE: On the first line of data for every program, raw values for each measure are reported; on the second line values are reported in standardized form, with mean = 50 and standard deviation = 10. "NA" indicates that the value for a measure is not available.

TABLE 10.1 Program Measures (Raw and Standardized Values) in Philosophy

Prog		Program Size			Characteristics of Program Graduates			
No.	University - Department/Academic Unit	(01)	(02)	(03)	(04)	(05)	(06)	(07)
041.	Michigan, University of-Ann Arbor	19	33	32	.43	7.4	.72	.39
	Philosophy	*60*	*65*	*52*	*60*	*53*	*58*	*58*
042.	Minnesota, University of	17	15	33	.15	6.8	.90	.55
	Philosophy	*56*	*47*	*53*	*41*	*57*	*69*	*68*
043.	Missouri, University of-Columbia	9	5	9	NA	NA	NA	NA
	Philosophy	*40*	*37*	*37*				
044.	Nebraska, University of-Lincoln	11	9	17	NA	NA	NA	NA
	Philosophy	*44*	*41*	*42*				
045.	New School for Social Research	3	37	32	.21	10.6	.45	.16
	Philosophy	*28*	*69*	*52*	*45*	*33*	*44*	*45*
046.	North Carolina, University of-Chapel Hill	15	17	26	.44	7.5	.61	.30
	Philosophy	*52*	*49*	*48*	*61*	*52*	*52*	*53*
047.	Northwestern University	11	28	27	.43	7.4	.55	.19
	Philosophy	*44*	*60*	*49*	*61*	*53*	*49*	*47*
048.	Notre Dame, University of	13	32	57	.37	8.1	.74	.34
	Philosophy	*48*	*64*	*69*	*56*	*49*	*59*	*56*
049.	Ohio State University-Columbus	19	14	37	.14	6.2	.64	.43
	Philosophy	*60*	*46*	*56*	*41*	*60*	*54*	*61*
050.	Oklahoma, University of-Norman	12	10	14	.10	8.5	.60	.10
	Philosophy	*46*	*42*	*40*	*38*	*46*	*52*	*41*
051.	Oregon, University of-Eugene	8	8	12	NA	NA	NA	NA
	Philosophy	*38*	*40*	*39*				
052.	Pennsylvania State University	14	28	30	.23	7.1	.64	.46
	Philosophy	*50*	*60*	*51*	*47*	*55*	*54*	*62*
053.	Pennsylvania, University of	13	26	25	.26	7.5	.64	.36
	Philosophy	*48*	*58*	*48*	*49*	*52*	*54*	*57*
054.	Pittsburgh, University of	15	7	21	.47	7.0	.71	.50
	*History and Philosophy of Science**	*52*	*39*	*45*	*63*	*55*	*58*	*65*
055.	Pittsburgh, University of	19	26	45	.44	6.3	.88	.63
	Philosophy	*60*	*58*	*61*	*61*	*59*	*67*	*72*
056.	Princeton University	18	41	26	.53	6.6	.89	.58
	Philosophy	*58*	*73*	*48*	*68*	*58*	*68*	*69*
057.	Purdue University-West Lafayette	15	14	12	.36	7.7	.36	.09
	Philosophy	*52*	*46*	*39*	*56*	*51*	*39*	*41*
058.	Rice University	6	6	22	NA	NA	NA	NA
	Philosophy	*34*	*38*	*46*				
059.	Rochester, University of	9	9	21	.09	5.7	.27	.18
	Philosophy	*40*	*41*	*45*	*37*	*64*	*34*	*46*
060.	Rutgers, The State University-New Brunswick	25	3	36	NA	NA	NA	NA
	Philosophy	*72*	*35*	*55*				

* indicates program was initiated since 1970.

NOTE: On the first line of data for every program, raw values for each measure are reported; on the second line values are reported in standardized form, with mean = 50 and standard deviation = 10. "NA" indicates that the value for a measure is not available.

TABLE 10.1 Program Measures (Raw and Standardized Values) in Philosophy

Prog	Survey Results				University Library	Survey Ratings Standard Error			
No.	(08)	(09)	(10)	(11)	(12)	(08)	(09)	(10)	(11)
041.	4.0	2.2	0.5	1.6	1.8	.08	.05	.08	.06
	65	*64*	*33*	*63*	*65*				
042.	3.0	1.8	0.9	1.2	1.2	.07	.05	.07	.07
	55	*57*	*44*	*53*	*59*				
043.	0.9	0.6	0.9	0.5	-0.2	.09	.11	.09	.06
	33	*33*	*45*	*35*	*45*				
044.	1.8	1.2	1.3	0.8	-0.5	.09	.11	.08	.07
	42	*44*	*58*	*45*	*42*				
045.	0.5	0.5	0.2	0.7	NA	.10	.09	.07	.07
	30	*32*	*22*	*41*					
046.	3.1	2.0	1.0	1.3	1.0	.07	.05	.07	.07
	56	*59*	*49*	*57*	*57*				
047.	2.5	1.4	1.1	1.2	0.3	.10	.10	.09	.06
	50	*49*	*50*	*54*	*50*				
048.	2.8	1.8	1.2	1.2	-1.3	.08	.08	.06	.06
	52	*55*	*55*	*54*	*34*				
049.	2.8	1.8	1.1	1.1	0.9	.08	.07	.05	.07
	52	*56*	*51*	*52*	*56*				
050.	1.4	0.7	1.3	0.6	-0.6	.11	.12	.09	.06
	38	*35*	*57*	*38*	*42*				
051.	1.3	0.7	0.8	0.5	-0.9	.12	.14	.09	.06
	37	*35*	*42*	*37*	*38*				
052.	2.2	1.4	1.0	0.9	0.7	.14	.12	.07	.07
	47	*48*	*47*	*45*	*54*				
053.	2.8	1.6	0.7	1.2	0.7	.09	.07	.08	.07
	52	*52*	*39*	*53*	*54*				
054.	4.4	2.3	1.3	1.7	0.1	.08	.07	.07	.06
	68	*66*	*58*	*66*	*48*				
055.	4.6	2.6	1.1	1.7	0.1	.07	.05	.05	.05
	71	*72*	*53*	*67*	*48*				
056.	4.7	2.7	1.0	1.8	0.9	.07	.06	.06	.05
	71	*73*	*48*	*68*	*56*				
057.	1.7	0.9	0.9	0.8	-0.5	.11	.09	.07	.06
	42	*40*	*46*	*43*	*42*				
058.	2.1	1.0	1.7	1.1	-1.4	.11	.10	.07	.07
	45	*40*	*70*	*52*	*33*				
059.	2.8	1.6	0.5	1.2	-0.6	.08	.06	.08	.07
	52	*53*	*31*	*55*	*41*				
060.	2.5	1.3	1.2	1.0	0.8	.08	.10	.09	.06
	49	*47*	*54*	*49*	*55*				

NOTE: On the first line of data for every program, raw values for each measure are reported; on the second line values are reported in standardized form, with mean = 50 and standard deviation = 10. "NA" indicates that the value for a measure is not available.

TABLE 10.1 Program Measures (Raw and Standardized Values) in Philosophy

Prog No.	University - Department/Academic Unit	Program Size			Characteristics of Program Graduates			
		(01)	(02)	(03)	(04)	(05)	(06)	(07)
061.	SUNY at Buffalo	22	35	44	.14	7.5	.60	.20
	Philosophy	*66*	*67*	*60*	*41*	*52*	*52*	*47*
062.	Saint Louis University	18	17	30	.29	8.0	.59	.24
	Philosophy	*58*	*49*	*51*	*51*	*49*	*51*	*49*
063.	Southern California, University of	11	17	15	.20	9.3	.46	.08
	Philosophy	*44*	*49*	*41*	*45*	*41*	*44*	*40*
064.	Southern Illinois University-Carbondale	14	22	19	.14	7.7	.46	.09
	Philosophy	*50*	*54*	*44*	*40*	*51*	*44*	*41*
065.	Stanford University	16	28	35	.21	7.0	.73	.46
	Philosophy	*54*	*60*	*54*	*46*	*55*	*59*	*63*
066.	Syracuse University	16	13	21	.25	9.5	.18	.00
	Philosophy	*54*	*45*	*45*	*48*	*40*	*28*	*36*
067.	Temple University	16	17	40	.07	7.5	.21	.07
	Philosophy	*54*	*49*	*58*	*36*	*52*	*30*	*40*
068.	Tennessee, University of-Knoxville	8	10	9	.08	9.0	.75	.33
	Philosophy	*38*	*42*	*37*	*37*	*43*	*60*	*55*
069.	Texas, University of-Austin	23	48	40	.32	6.9	.43	.17
	Philosophy	*68*	*79*	*58*	*53*	*56*	*43*	*46*
070.	Tulane University	10	12	30	.67	8.0	.60	.20
	Philosophy	*42*	*44*	*51*	*77*	*49*	*52*	*47*
071.	Vanderbilt University	12	25	41	.30	6.5	.67	.11
	Philosophy	*46*	*57*	*58*	*51*	*58*	*56*	*42*
072.	Virginia, University of	11	10	19	.40	7.0	.60	.20
	Philosophy	*44*	*42*	*44*	*59*	*55*	*52*	*47*
073.	Washington University-Saint Louis	12	20	27	.20	5.4	.68	.24
	Philosophy	*46*	*52*	*49*	*45*	*65*	*56*	*50*
074.	Washington, University of-Seattle	15	26	6	NA	NA	NA	NA
	Philosophy	*52*	*58*	*35*				
075.	Wayne State University	10	17	6	NA	NA	NA	NA
	Philosophy	*42*	*49*	*35*				
076.	Wisconsin, University of-Madison	23	22	66	.34	7.8	.61	.26
	Philosophy	*68*	*54*	*75*	*55*	*51*	*53*	*51*
077.	Yale University	15	42	41	.30	6.2	.47	.27
	Philosophy	*52*	*73*	*58*	*52*	*61*	*44*	*51*

* indicates program was initiated since 1970.

NOTE: On the first line of data for every program, raw values for each measure are reported; on the second line values are reported in standardized form, with mean = 50 and standard deviation = 10. "NA" indicates that the value for a measure is not available.

TABLE 10.1 Program Measures (Raw and Standardized Values) in Philosophy

Prog No.	Survey Results				University Library	Survey Ratings Standard Error			
	(08)	(09)	(10)	(11)	(12)	(08)	(09)	(10)	(11)
061.	2.2	1.3	1.0	0.8	0.3	.09	.11	.05	.06
	47	*47*	*47*	*45*	*50*				
062.	1.9	1.3	0.9	0.5	NA	.16	.17	.09	.06
	44	*46*	*45*	*37*					
063.	3.2	1.7	1.8	1.2	0.4	.09	.07	.06	.07
	56	*55*	*75*	*54*	*51*				
064.	1.0	0.6	1.0	0.5	-0.2	.11	.12	.08	.06
	34	*33*	*47*	*36*	*45*				
065.	4.1	2.3	1.2	1.6	2.0	.08	.07	.06	.06
	66	*65*	*54*	*63*	*68*				
066.	3.0	1.6	1.8	1.3	-0.3	.09	.09	.06	.07
	54	*53*	*75*	*57*	*44*				
067.	2.6	1.5	1.1	1.2	-0.4	.08	.09	.05	.06
	50	*50*	*50*	*54*	*43*				
068.	1.1	0.6	1.2	0.5	-0.4	.12	.13	.08	.06
	35	*34*	*54*	*36*	*43*				
069.	3.0	1.8	0.9	1.3	1.6	.09	.08	.08	.06
	55	*56*	*46*	*57*	*63*				
070.	1.5	1.2	0.8	0.7	-1.0	.12	.11	.06	.07
	39	*44*	*42*	*41*	*37*				
071.	2.1	1.4	1.0	0.9	-0.7	.12	.12	.05	.07
	46	*49*	*49*	*46*	*40*				
072.	2.0	1.2	1.0	0.8	0.7	.10	.10	.07	.06
	44	*45*	*49*	*43*	*55*				
073.	2.4	1.4	0.9	1.1	-0.4	.09	.09	.07	.06
	49	*49*	*43*	*50*	*43*				
074.	2.4	1.4	1.1	0.9	1.5	.11	.12	.08	.07
	49	*48*	*51*	*47*	*62*				
075.	1.7	1.0	0.7	0.8	-0.4	.12	.12	.09	.08
	42	*41*	*37*	*44*	*44*				
076.	3.2	1.8	1.1	1.2	1.6	.08	.07	.07	.06
	57	*56*	*50*	*55*	*63*				
077.	3.3	1.7	0.9	1.6	2.1	.10	.09	.08	.05
	57	*55*	*45*	*64*	*68*				

NOTE: On the first line of data for every program, raw values for each measure are reported; on the second line values are reported in standardized form, with mean = 50 and standard deviation = 10. "NA" indicates that the value for a measure is not available.

TABLE 10.2 Summary Statistics Describing Each Program Measure--Philosophy

Measure	Number of Programs Evaluated	Mean	Standard Deviation	DECILES								
				1	2	3	4	5	6	7	8	9
Program Size												
01 Raw Value	77	14	5	8	9	11	13	13	15	17	18	21
Std Value	77	50	10	38	40	44	48	48	52	56	58	64
02 Raw Value	77	18	10	7	9	11	13	15	18	24	27	33
Std Value	77	50	10	39	41	43	45	47	50	56	59	65
03 Raw Value	77	29	15	11	15	20	22	26	30	35	41	47
Std Value	77	50	10	39	41	44	46	48	51	54	58	62
Program Graduates												
04 Raw Value	56	.27	.14	.09	.14	.20	.22	.25	.30	.36	.41	.45
Std Value	56	50	10	37	41	45	46	49	52	56	60	63
05 Raw Value	56	7.9	1.6	10.0	9.0	8.6	7.8	7.6	7.5	7.1	6.7	6.2
Std Value	56	50	10	37	43	45	50	52	52	55	57	60
06 Raw Value	56	.57	.18	.33	.42	.46	.50	.55	.61	.67	.72	.80
Std Value	56	50	10	37	42	44	46	49	52	56	58	63
07 Raw Value	56	.25	.17	.00	.09	.15	.19	.20	.25	.31	.42	.51
Std Value	56	50	10	35	41	44	46	47	50	54	60	65
Survey Results												
08 Raw Value	77	2.6	1.0	1.3	1.7	1.9	2.1	2.4	2.8	3.1	3.3	4.1
Std Value	77	50	10	37	41	43	45	48	52	55	57	65
09 Raw Value	77	1.5	.5	.7	1.0	1.2	1.3	1.4	1.6	1.8	1.9	2.2
Std Value	77	50	10	35	41	45	47	49	52	56	58	64
10 Raw Value	76	1.1	.3	.7	.9	.9	1.0	1.1	1.1	1.2	1.2	1.4
Std Value	76	50	10	38	45	45	48	51	51	55	55	61
11 Raw Value	77	1.1	.4	.5	.7	.8	.8	1.0	1.2	1.3	1.5	1.6
Std Value	77	50	10	36	41	44	44	49	54	56	61	64
University Library												
12 Raw Value	64	.3	1.0	-.9	-.6	-.4	-.3	.1	.3	.8	1.0	1.8
Std Value	64	50	10	38	41	43	44	48	50	55	57	65

NOTE: Standardized values reported in the preceding table have been computed from exact values of the mean and standard deviation and not the rounded values reported here.

TABLE 10.3 Intercorrelations Among Program Measures on 77 Programs in Philosophy

	Measure											
	01	02	03	04	05	06	07	08	09	10	11	12
Program Size												
01		.36	.45	-.02	-.24	-.03	-.02	.38	.39	.12	.21	.43
02			.50	-.02	.13	.19	.28	.42	.45	-.23	.43	.49
03				.02	-.01	.01	.13	.36	.41	-.04	.31	.28
Program Graduates												
04					-.01	.25	.20	.24	.27	.15	.20	.03
05						.11	.46	.33	.36	-.18	.38	.03
06							.74	.34	.37	-.05	.26	.21
07								.61	.61	-.17	.58	.36
Survey Results												
08									.97	.20	.95	.57
09										.12	.90	.54
10											.18	-.17
11												.51
University Library												
12												

NOTE: Since in computing correlation coefficients program data must be available for both of the measures being correlated, the actual number of programs on which each coefficient is based varies.

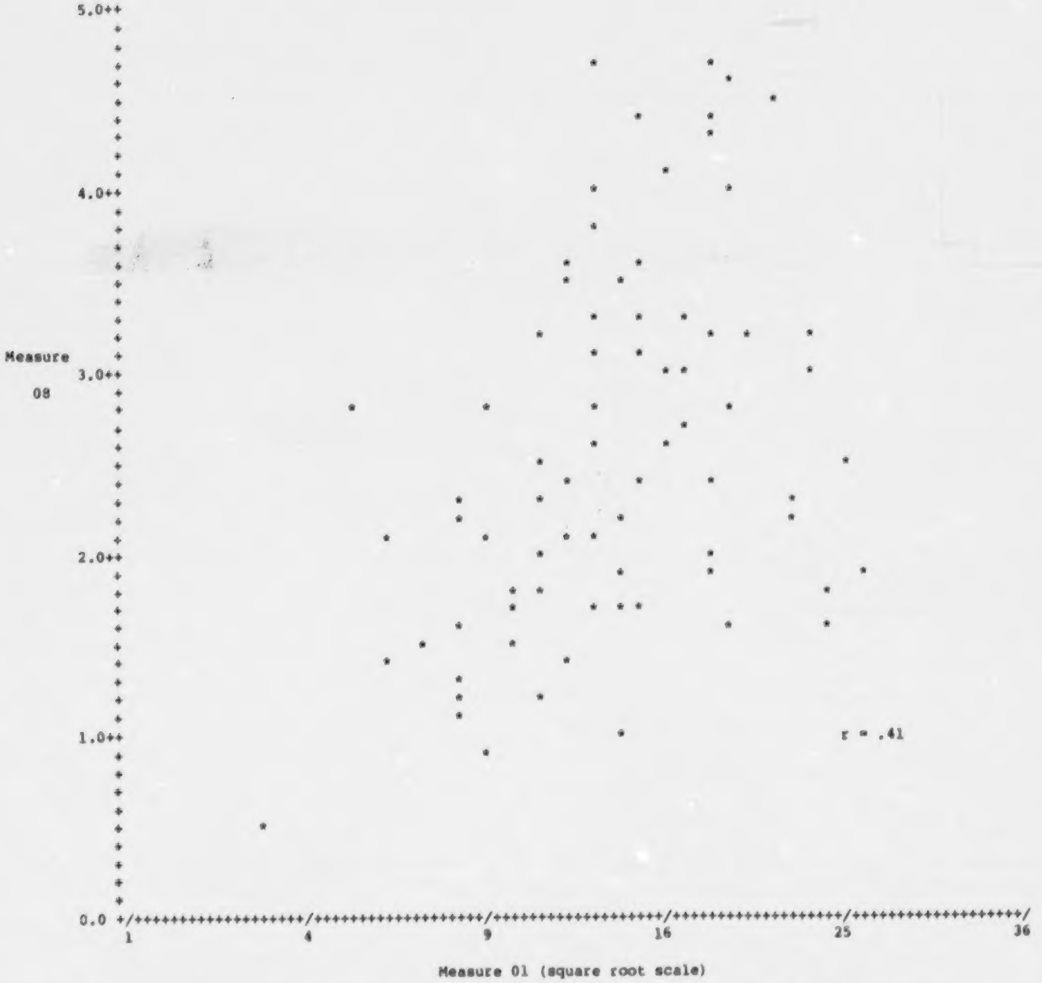

FIGURE 10.1 Mean rating of scholarly quality of faculty (measure 08) versus number of faculty members (measure 01)--77 programs in philosophy.

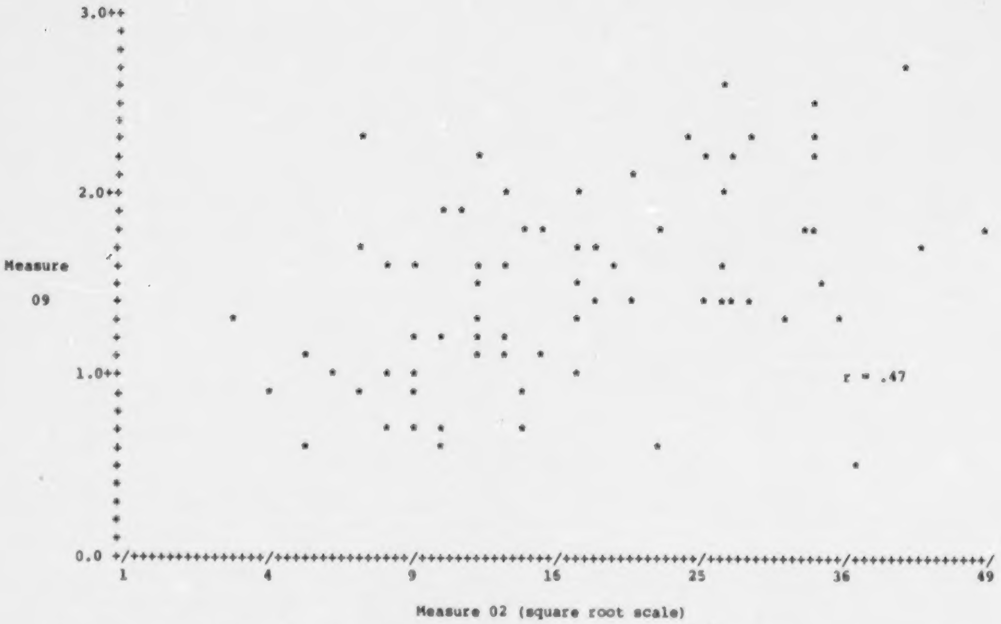

FIGURE 10.2 Mean rating of program effectiveness in educating research scholars/scientists (measure 09) versus number of graduates in last five years (measure 02)--77 programs in philosophy.

TABLE 10.4 Characteristics of Survey Participants in Philosophy

	Respondents	
	N	%
Field of Specialization		
Philosophy	151	96
Other/Unknown	6	4
Faculty Rank		
Professor	96	61
Associate Professor	42	27
Assistant Professor	18	12
Other/Unknown	1	1
Year of Highest Degree		
Pre-1950	11	7
1950-59	36	23
1960-69	65	41
Post-1969	42	27
Unknown	3	2
Evaluator Selection		
Nominated by Institution	132	84
Other	25	16
Survey Form		
With Faculty Names	143	91
Without Names	14	9
Total Evaluators	157	100

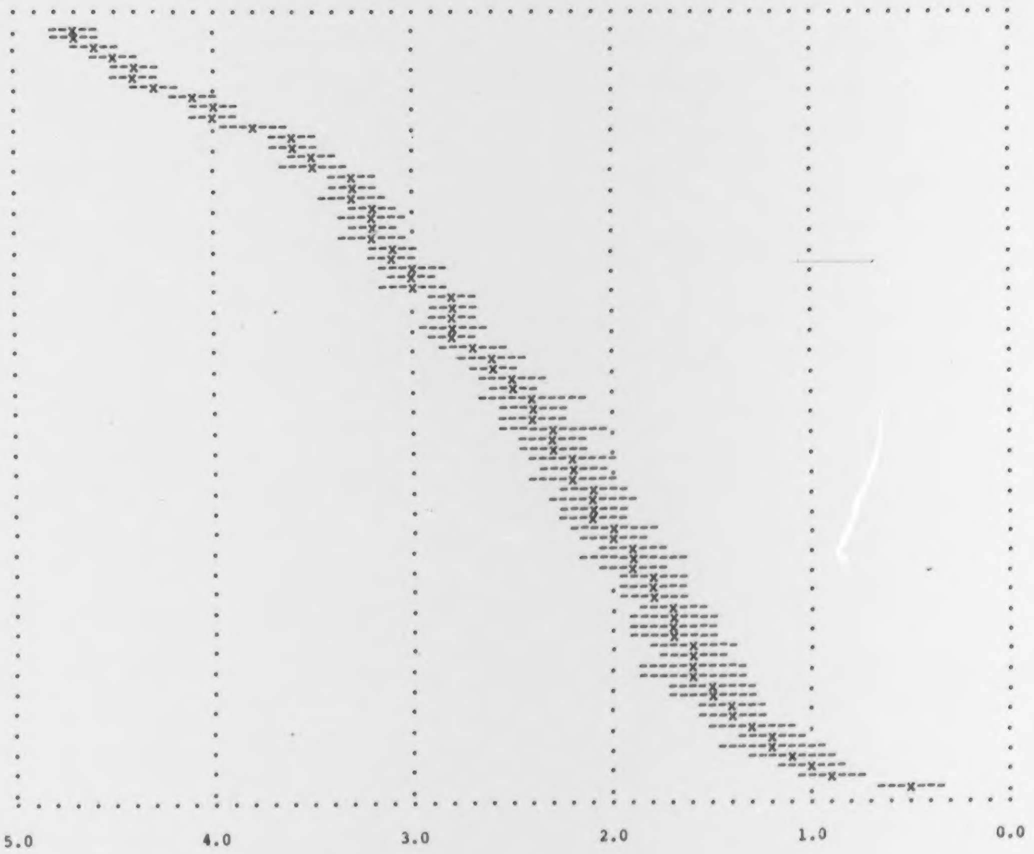

FIGURE 10.3 Mean rating of scholarly quality of faculty in 77 programs in philosophy.

NOTE: Programs are listed in sequence of mean rating, with the highest-rated program appearing at the top of the page. The broken lines (---) indicate a confidence interval of ±1.5 standard errors around the reported mean (x) of each program.

XI

Spanish Language and Literature Programs

In this chapter 69 research-doctorate programs in Spanish language and literature are assessed. These programs, according to the information supplied by their universities, have accounted for 812 doctoral degrees awarded during the FY1976-80 period--approximately 87 percent of the aggregate number of Spanish and Portuguese language and literature doctorates earned from U.S. universities in this five-year span.[1] With respect to this percentage it should be pointed out that five of the university coordinators providing program information to the committee were unable to determine how many of the recent graduates from the departments of romance languages or modern languages were degree recipients in Spanish. Data for these five programs are not included in the above estimate. On the average, 24 full-time and part-time students intending to earn doctorates were enrolled in a program in December 1980, with an average faculty size of 10 members.[2] Almost half of the 69 programs, listed in Table 11.1, are located in Spanish or Spanish and Portuguese departments. The other programs are found in departments of romance languages, modern languages, or other foreign languages. Only four of the programs were initiated since 1970, and no two programs are located in the same university. In addition to the 69 institutions represented in this discipline, another 3 were initially identified as meeting the criteria[3] for inclusion in the assessment:

Case Western Reserve University
Middlebury College
Saint Louis University

Spanish programs at these three institutions have not been included in the evaluations in this discipline, since in each case the study coordinator either indicated that the institution did not at that time have a research-doctorate program in Spanish or failed to provide the information requested by the committee.

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[1] Data from the NRC's Survey of Earned Doctorates indicate that 933 research doctorates in Spanish and Portuguese language and literature were awarded by U.S. universities between FY1976 and FY1980.

[2] See the reported means for measures 03 and 01 in Table 11.2.

[3] As mentioned in Chapter I, the primary criterion for inclusion was that a university had awarded at least 5 doctorates in Spanish during the FY1976-78 period.

Before examining individual program results presented in Table 11.1, the reader is urged to refer to Chapter II, in which each of the 12 measures used in the assessment is discussed. Summary statistics describing every measure are given in Table 11.2. For eight of the measures, data are reported for at least 63 of the 69 Spanish programs. For measures 04-07, which pertain to characteristics of the program graduates, data are presented for only approximately half of the programs; the other half had too few graduates on which to base statistics.[4]

Intercorrelations among the 12 measures (Pearson product-moment coefficients) are given in Table 11.3. Of particular note are the high positive correlations of the measures of library size (12) with reputational survey ratings (08, 09). Figure 11.1 illustrates the relation between the mean rating of the scholarly quality of faculty (measure 08) and the number of faculty members (measure 01) for each of 69 programs in Spanish. Figure 11.2 plots the mean rating of program effectiveness (measure 09) against the total number of FY1976-80 program graduates (measure 02). Although in both figures there is a significant positive correlation between program size and reputational rating, it is quite apparent that some of the smaller programs received high mean ratings and that some of the larger programs received low mean ratings.

Table 11.4 describes the 136 faculty members who participated in the evaluation of Spanish language and literature programs. These individuals constituted 66 percent of those asked to respond to the survey in this discipline and 20 percent of the faculty population in the 69 research-doctorate programs being evaluated.[5] Approximately one-third of the survey participants had earned their highest degree since 1970, and a majority were full professors.

To assist the reader in interpreting results of the survey evaluations, estimated standard errors have been computed for mean ratings of the scholarly quality of faculty in 69 Spanish programs (and are given in Table 11.1). For each program the mean rating and an associated "confidence interval" of 1.5 standard errors are illustrated in Figure 11.3 (listed in order of highest to lowest mean rating). In comparing two programs, if their confidence intervals do not overlap, one may conclude that there is a significant difference in their mean ratings at a .05 level of significance.[6] From this figure it is also apparent that one should have somewhat more confidence in the accuracy of the mean ratings of higher-rated programs than lower-rated programs. This generalization results primarily from the fact that evaluators are not as likely to be familiar with the less prestigious programs, and consequently the mean ratings of these programs are usually based on fewer survey responses.

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[4] As mentioned in Chapter II, data for measures 04-07 are not reported if they are based on the survey responses of fewer than 10 FY1975-79 program graduates.

[5] See Table 2.3 in Chapter II.

[6] See pp. 28-30 for a discussion of the interpretation of mean ratings and associated confidence intervals.

TABLE 11.1 Program Measures (Raw and Standardized Values) in Spanish Lang. & Lit.

Prog No.	University - Department/Academic Unit	Program Size (01)	(02)	(03)	Characteristics of Program Graduates (04)	(05)	(06)	(07)
001.	Arizona State University-Tempe	12	6	18	NA	NA	NA	NA
	*Foreign Languages**	*55*	*42*	*48*				
002.	Arizona, University of-Tucson	16	16	23	.33	11.8	.71	.33
	Romance Languages	*64*	*54*	*50*	*57*	*35*	*58*	*55*
003.	Brown University	7	14	25	NA	8.5	NA	NA
	Hispanic and Italian Studies	*43*	*52*	*51*		*53*		
004.	CUNY-Graduate School	8	32	81	.08	10.5	.46	.23
	Spanish	*45*	*72*	*72*	*38*	*42*	*40*	*47*
005.	California, University of-Berkeley	18	17	15	.17	7.2	.39	.33
	Spanish and Portuguese Programs	*69*	*55*	*47*	*44*	*60*	*35*	*55*
006.	California, University of-Davis	8	6	5	NA	NA	NA	NA
	Spanish and Classics	*45*	*42*	*43*				
007.	California, University of-Irvine	11	7	36	NA	NA	NA	NA
	Spanish and Portuguese	*52*	*43*	*55*				
008.	California, University of-Los Angeles	18	27	35	.27	8.4	.49	.19
	Spanish and Portuguese	*69*	*66*	*54*	*52*	*54*	*42*	*44*
009.	California, University of-Riverside	6	7	11	NA	NA	NA	NA
	Literatures and Languages	*40*	*43*	*45*				
010.	California, University of-San Diego	6	7	26	NA	NA	NA	NA
	Literature	*40*	*43*	*51*				
011.	California, University of-Santa Barbara	15	6	7	NA	NA	NA	NA
	Spanish and Portuguese	*62*	*42*	*44*				
012.	Catholic University of America	5	11	21	.15	11.0	.55	.09
	Modern Languages	*38*	*48*	*49*	*43*	*39*	*46*	*36*
013.	Cincinnati, University of	4	6	23	NA	NA	NA	NA
	Romance Languages and Literature	*36*	*42*	*50*				
014.	Colorado, University of	12	23	22	.13	10.7	.67	.19
	Spanish and Portuguese	*55*	*62*	*49*	*41*	*41*	*55*	*44*
015.	Columbia University	7	13	42	.23	10.0	.54	.15
	Spanish and Portuguese	*43*	*50*	*57*	*49*	*45*	*45*	*41*
016.	Connecticut, University of-Storrs	10	6	9	NA	NA	NA	NA
	Romance and Classical Languages	*50*	*42*	*45*				
017.	Cornell University-Ithaca	8	NA	NA	.25	7.0	.67	.17
	Romance Studies	*45*			*51*	*61*	*55*	*42*
018.	Duke University	6	12	2	.30	8.0	.50	.10
	Romance Languages	*40*	*49*	*42*	*55*	*56*	*43*	*37*
019.	Emory University	5	10	8	NA	NA	NA	NA
	Modern Languages and Classics	*38*	*47*	*44*				
020.	Florida State University-Tallahassee	7	13	18	.20	6.8	.40	.13
	Modern Languages	*43*	*50*	*48*	*47*	*62*	*36*	*39*

* indicates program was initiated since 1970.

NOTE: On the first line of data for every program, raw values for each measure are reported; on the second line values are reported in standardized form, with mean = 50 and standard deviation = 10. "NA" indicates that the value for a measure is not available.

TABLE 11.1 Program Measures (Raw and Standardized Values) in Spanish Lang. & Lit.

Prog	Survey Results				University Library	Survey Ratings Standard Error			
No.	(08)	(09)	(10)	(11)	(12)	(08)	(09)	(10)	(11)
001.	2.3	1.4	1.3	1.0	-0.3	.11	.08	.07	.06
	45	*44*	*64*	*46*	*43*				
002.	2.7	1.7	1.2	1.2	0.9	.10	.07	.07	.06
	50	*53*	*57*	*52*	*56*				
003.	3.4	2.1	1.0	1.3	-1.1	.11	.06	.08	.07
	60	*61*	*50*	*56*	*36*				
004.	2.8	1.6	0.7	1.2	NA	.09	.06	.08	.06
	52	*48*	*39*	*51*					
005.	4.0	2.3	0.9	1.6	2.2	.09	.06	.07	.05
	67	*68*	*46*	*64*	*69*				
006.	2.4	1.5	1.0	0.9	0.6	.11	.07	.08	.07
	47	*46*	*52*	*43*	*53*				
007.	3.0	1.9	1.3	1.4	NA	.10	.07	.07	.07
	55	*57*	*61*	*59*					
008.	3.7	2.1	1.3	1.4	2.0	.08	.04	.08	.06
	63	*63*	*62*	*60*	*67*				
009.	2.5	1.5	0.9	1.1	-1.0	.10	.06	.06	.06
	48	*46*	*47*	*49*	*36*				
010.	3.6	1.9	0.8	1.4	-0.0	.11	.08	.09	.07
	62	*56*	*40*	*60*	*46*				
011.	2.9	1.7	1.4	1.1	-0.1	.10	.08	.08	.07
	53	*53*	*66*	*49*	*46*				
012.	2.0	1.4	0.8	0.9	NA	.13	.08	.08	.06
	42	*44*	*42*	*43*					
013.	1.8	1.2	0.9	1.1	-0.2	.13	.09	.06	.07
	39	*39*	*45*	*48*	*44*				
014.	1.8	1.2	0.8	0.8	-0.9	.13	.09	.08	.07
	39	*39*	*43*	*37*	*38*				
015.	3.4	1.9	1.0	1.5	1.7	.11	.06	.09	.06
	60	*56*	*48*	*61*	*64*				
016.	2.3	1.4	1.3	1.1	-0.5	.10	.08	.08	.06
	45	*45*	*61*	*48*	*42*				
017.	3.4	2.0	1.1	1.3	1.6	.10	.08	.08	.07
	60	*61*	*55*	*54*	*63*				
018.	3.2	1.8	1.0	1.3	0.3	.11	.07	.07	.07
	56	*56*	*49*	*56*	*50*				
019.	1.2	0.8	0.6	0.7	-0.6	.14	.10	.09	.07
	31	*29*	*32*	*36*	*40*				
020.	1.7	1.1	0.8	0.8	-0.4	.11	.09	.10	.06
	37	*37*	*41*	*39*	*42*				

NOTE: On the first line of data for every program, raw values for each measure are reported; on the second line values are reported in standardized form, with mean = 50 and standard deviation = 10. "NA" indicates that the value for a measure is not available.

TABLE 11.1 Program Measures (Raw and Standardized Values) in Spanish Lang. & Lit.

Prog		Program Size			Characteristics of Program Graduates			
No.	University - Department/Academic Unit	(01)	(02)	(03)	(04)	(05)	(06)	(07)
021.	Florida, University of-Gainesville	9	6	9	NA	NA	NA	NA
	Romance Languages and Literatures	*47*	*42*	*45*				
022.	Georgetown University	7	6	9	NA	NA	NA	NA
	Spanish	*43*	*42*	*45*				
023.	Georgia, University of-Athens	7	8	4	NA	NA	NA	NA
	Romance Languages	*43*	*45*	*43*				
024.	Harvard University	9	NA	17	.25	8.8	.71	.38
	Romance Languages and Literatures	*47*		*48*	*51*	*52*	*58*	*59*
025.	Illinois, University-Urbana/Champaign	14	33	52	.31	8.0	.63	.35
	Spanish, Italian, and Portuguese	*59*	*73*	*61*	*55*	*56*	*52*	*57*
026.	Indiana University-Bloomington	18	19	47	.15	9.8	.62	.19
	Spanish and Portuguese	*69*	*57*	*59*	*43*	*46*	*51*	*44*
027.	Iowa, University of-Iowa City	16	14	18	.28	8.5	.77	.41
	Spanish and Portuguese	*64*	*52*	*48*	*53*	*53*	*62*	*62*
028.	Johns Hopkins University	2	15	9	.13	5.0	.47	.27
	Romance Languages	*31*	*53*	*45*	*42*	*72*	*40*	*50*
029.	Kansas, University of	12	15	15	.29	7.8	.64	.43
	Spanish and Portuguese	*55*	*53*	*47*	*54*	*57*	*53*	*63*
030.	Kentucky, University of	9	25	33	.41	9.0	.52	.17
	Spanish and Italian Language & Literatures	*47*	*64*	*54*	*63*	*50*	*44*	*43*
031.	Louisiana State University-Baton Rouge	6	6	11	NA	NA	NA	NA
	Spanish & Portuguese Language & Literature	*40*	*42*	*45*				
032.	Maryland, University of-College Park	8	10	19	NA	NA	NA	NA
	Spanish and Portuguese	*45*	*47*	*48*				
033.	Massachusetts, University of-Amherst	13	13	29	.00	10.0	.85	.31
	Spanish and Portuguese	*57*	*50*	*52*	*32*	*45*	*67*	*53*
034.	Miami, University of-Florida	6	5	5	NA	NA	NA	NA
	Foreign Languages	*40*	*41*	*43*				
035.	Michigan State University-East Lansing	10	11	21	.00	NA	NA	NA
	Romance & Classical Languages & Literatures	*50*	*48*	*49*	*32*			
036.	Michigan, University of-Ann Arbor	13	5	17	.36	8.8	.30	.10
	Romance Languages and Literatures	*57*	*41*	*48*	*60*	*52*	*29*	*37*
037.	Minnesota, University of	13	17	31	.10	10.0	.90	.50
	Spanish and Portuguese	*57*	*55*	*53*	*39*	*45*	*71*	*69*
038.	Missouri, University of-Columbia	10	6	10	NA	NA	NA	NA
	Romance Languages	*50*	*42*	*45*				
039.	Nebraska, University of-Lincoln	9	3	8	NA	NA	NA	NA
	Modern Languages and Literatures	*47*	*39*	*44*				
040.	New Mexico, University of-Albuquerque	10	26	42	.32	9.8	.52	.33
	Modern and Classical Languages	*50*	*65*	*57*	*56*	*46*	*44*	*55*

* indicates program was initiated since 1970.

NOTE: On the first line of data for every program, raw values for each measure are reported; on the second line values are reported in standardized form, with mean = 50 and standard deviation = 10. "NA" indicates that the value for a measure is not available.

TABLE 11.1 Program Measures (Raw and Standardized Values) in Spanish Lang. & Lit.

Prog No.	Survey Results (08)	(09)	(10)	(11)	University Library (12)	Survey Ratings Standard Error (08)	(09)	(10)	(11)
021.	1.8	1.2	0.6	0.9	0.8	.12	.09	.09	.07
	39	*40*	*34*	*40*	*55*				
022.	2.1	1.3	0.9	0.7	-0.6	.14	.09	.10	.07
	42	*43*	*44*	*36*	*40*				
023.	2.3	1.5	1.3	1.1	0.4	.10	.08	.10	.07
	46	*47*	*63*	*48*	*51*				
024.	4.5	2.3	1.2	1.8	3.0	.09	.07	.07	.04
	74	*68*	*58*	*73*	*77*				
025.	3.4	2.1	0.8	1.4	2.0	.09	.06	.07	.06
	59	*62*	*42*	*60*	*67*				
026.	3.5	2.1	1.0	1.5	0.9	.08	.05	.09	.05
	61	*61*	*50*	*62*	*56*				
027.	2.3	1.5	0.9	1.0	0.3	.11	.08	.08	.07
	46	*48*	*47*	*45*	*50*				
028.	2.4	1.6	0.2	1.2	-0.4	.16	.10	.05	.07
	47	*48*	*18*	*52*	*43*				
029.	3.5	2.2	1.3	1.5	0.1	.10	.06	.06	.07
	61	*65*	*63*	*62*	*48*				
030.	3.1	1.9	1.1	1.5	-0.1	.11	.06	.06	.06
	56	*58*	*56*	*61*	*46*				
031.	1.7	1.2	1.4	0.7	-0.3	.12	.09	.09	.07
	38	*40*	*66*	*36*	*43*				
032.	2.9	1.6	1.3	1.2	0.2	.10	.07	.09	.07
	53	*48*	*61*	*52*	*48*				
033.	2.4	1.6	1.0	1.1	-0.7	.11	.08	.06	.07
	47	*50*	*49*	*47*	*39*				
034.	1.9	1.1	0.8	1.1	NA	.09	.08	.06	.07
	40	*38*	*43*	*47*					
035.	2.3	1.5	0.9	1.1	0.3	.10	.07	.07	.06
	45	*46*	*48*	*49*	*50*				
036.	3.8	2.1	1.0	1.5	1.8	.08	.06	.08	.06
	65	*63*	*51*	*64*	*65*				
037.	3.0	1.9	1.3	1.3	1.2	.10	.06	.07	.06
	55	*58*	*63*	*57*	*59*				
038.	2.2	1.5	1.1	0.9	-0.2	.10	.08	.09	.07
	44	*46*	*53*	*40*	*45*				
039.	2.0	1.2	1.2	1.0	-0.5	.10	.07	.10	.07
	41	*39*	*60*	*46*	*41*				
040.	2.6	1.7	1.0	1.1	-1.0	.10	.08	.06	.06
	49	*52*	*50*	*48*	*37*				

NOTE: On the first line of data for every program, raw values for each measure are reported; on the second line values are reported in standardized form, with mean = 50 and standard deviation = 10. "NA" indicates that the value for a measure is not available.

TABLE 11.1 Program Measures (Raw and Standardized Values) in Spanish Lang. & Lit.

Prog No.	University - Department/Academic Unit	Program Size			Characteristics of Program Graduates			
		(01)	(02)	(03)	(04)	(05)	(06)	(07)
041.	New York University	15	30	23	.17	11.0	.77	.24
	Spanish & Portuguese Languages & Literature	*62*	*70*	*50*	*44*	*39*	*62*	*47*
042.	North Carolina, University of-Chapel Hill	9	15	28	.27	7.8	.73	.33
	Romance Languages	*47*	*53*	*52*	*52*	*57*	*59*	*55*
043.	Northwestern University	6	7	6	NA	NA	NA	NA
	Spanish and Portuguese	*40*	*43*	*43*				
044.	Ohio State University-Columbus	9	NA	NA	NA	NA	NA	NA
	Romance Languages and Literatures	*47*						
045.	Oklahoma, University of-Norman	6	12	6	.12	11.0	.59	.35
	Modern Languages	*40*	*49*	*43*	*41*	*39*	*49*	*57*
046.	Oregon, University of-Eugene	7	3	6	NA	NA	NA	NA
	Romance Languages	*43*	*39*	*43*				
047.	Pennsylvania State University	13	10	9	.27	8.8	.46	.00
	Spanish	*57*	*47*	*45*	*53*	*52*	*40*	*29*
048.	Pennsylvania, University of	9	NA	NA	.13	8.0	.50	.23
	Romance Languages	*47*			*41*	*56*	*43*	*47*
049.	Pittsburgh, University of	9	19	21	.33	10.5	.42	.17
	Hispanic Languages and Literatures	*47*	*57*	*49*	*57*	*42*	*37*	*42*
050.	Princeton University	7	11	16	.33	6.0	.75	.58
	Romance Languages and Literatures	*43*	*48*	*47*	*57*	*67*	*61*	*75*
051.	Puerto Rico, University of	20	23	195	.00	14.5	.80	.30
	Hispanic Studies	*74*	*62*	*99*	*32*	*20*	*64*	*53*
052.	Purdue University-West Lafayette	11	3	7	NA	NA	NA	NA
	*Foreign Languages and Literatures**	*52*	*39*	*44*				
053.	Rutgers, The State University-New Brunswick	11	14	58	.22	11.0	.56	.19
	Spanish	*52*	*52*	*63*	*49*	*39*	*47*	*44*
054.	SUNY at Albany	11	2	36	NA	NA	NA	NA
	Hispanic and Italian Studies	*52*	*38*	*55*				
055.	SUNY at Buffalo	11	13	16	.40	7.1	.82	.46
	Modern Languages and Literatures	*52*	*50*	*47*	*62*	*61*	*65*	*65*
056.	Southern California, University of	7	21	17	.40	10.1	.71	.24
	Spanish and Portuguese	*43*	*60*	*48*	*62*	*44*	*57*	*47*
057.	Stanford University	10	5	17	NA	NA	NA	NA
	Spanish and Portuguese	*50*	*41*	*48*				
058.	Syracuse University	7	1	10	NA	NA	NA	NA
	Foreign Languages and Literatures	*43*	*37*	*45*				
059.	Temple University	9	9	15	NA	NA	NA	NA
	*Spanish and Portuguese**	*47*	*46*	*47*				
060.	Tennessee, University of-Knoxville	7	7	8	NA	NA	NA	NA
	Romance Languages	*43*	*43*	*44*				

* indicates program was initiated since 1970.

NOTE: On the first line of data for every program, raw values for each measure are reported; on the second line values are reported in standardized form, with mean = 50 and standard deviation = 10. "NA" indicates that the value for a measure is not available.

TABLE 11.1 Program Measures (Raw and Standardized Values) in Spanish Lang. & Lit.

Prog	Survey Results				University Library	Survey Ratings Standard Error			
No.	(08)	(09)	(10)	(11)	(12)	(08)	(09)	(10)	(11)
041.	2.7	1.7	1.0	1.1	0.5	.09	.07	.07	.07
	50	*51*	*51*	*47*	*51*				
042.	3.1	1.9	0.9	1.4	1.0	.08	.06	.06	.06
	55	*56*	*45*	*59*	*57*				
043.	2.1	1.3	0.8	0.9	0.3	.12	.08	.07	.07
	42	*43*	*43*	*43*	*50*				
044.	2.0	1.3	0.6	0.7	0.9	.12	.08	.09	.06
	41	*43*	*32*	*35*	*56*				
045.	1.2	0.8	0.8	0.6	-0.6	.12	.09	.09	.06
	31	*28*	*40*	*30*	*41*				
046.	1.6	1.1	0.6	0.6	-0.9	.12	.11	.09	.06
	36	*36*	*34*	*31*	*37*				
047.	2.7	1.7	1.1	1.2	0.7	.11	.08	.07	.07
	51	*53*	*56*	*53*	*54*				
048.	4.3	2.4	1.2	1.6	0.7	.08	.06	.06	.06
	72	*71*	*57*	*66*	*54*				
049.	3.2	1.9	0.9	1.4	0.1	.09	.06	.08	.07
	57	*57*	*46*	*58*	*47*				
050.	3.3	2.0	0.7	1.4	0.9	.13	.07	.07	.06
	59	*59*	*38*	*58*	*56*				
051.	2.3	1.4	1.2	0.6	NA	.15	.13	.13	.06
	45	*45*	*60*	*31*					
052.	2.1	1.2	1.0	1.0	-0.5	.11	.08	.11	.07
	42	*39*	*49*	*44*	*41*				
053.	2.5	1.6	1.0	1.1	0.8	.10	.07	.05	.07
	48	*50*	*49*	*48*	*55*				
054.	2.8	1.4	1.2	1.2	-1.0	.12	.09	.09	.08
	52	*44*	*60*	*50*	*37*				
055.	2.9	1.8	1.2	1.2	0.3	.09	.06	.08	.07
	53	*54*	*57*	*53*	*49*				
056.	2.0	1.5	0.9	1.0	0.4	.12	.10	.11	.07
	42	*46*	*45*	*45*	*50*				
057.	3.7	2.1	1.1	1.4	2.0	.10	.06	.06	.07
	63	*63*	*55*	*60*	*67*				
058.	2.2	1.2	1.0	1.0	-0.3	.12	.09	.08	.08
	43	*40*	*52*	*45*	*43*				
059.	1.6	1.3	0.9	0.6	-0.4	.11	.10	.10	.06
	36	*41*	*46*	*32*	*42*				
060.	1.5	0.9	0.8	0.7	-0.4	.12	.09	.08	.07
	35	*32*	*42*	*36*	*42*				

NOTE: On the first line of data for every program, raw values for each measure are reported; on the second line values are reported in standardized form, with mean = 50 and standard deviation = 10. "NA" indicates that the value for a measure is not available.

TABLE 11.1 Program Measures (Raw and Standardized Values) in Spanish Lang. & Lit.

Prog No.	University - Department/Academic Unit	Program Size			Characteristics of Program Graduates			
		(01)	(02)	(03)	(04)	(05)	(06)	(07)
061.	Texas Tech University-Lubbock	11	9	12	NA	NA	NA	NA
	*Classical and Romance Languages**	*52*	*46*	*46*				
062.	Texas, University of-Austin	28	27	50	.37	8.4	.56	.36
	Spanish and Portuguese	*93*	*66*	*60*	*60*	*53*	*47*	*57*
063.	Tulane University	10	5	24	NA	NA	NA	NA
	Spanish and Portuguese	*50*	*41*	*50*				
064.	Vanderbilt University	9	7	6	NA	NA	NA	NA
	Spanish and Portuguese	*47*	*43*	*43*				
065.	Virginia, University of	11	10	15	.13	8.3	.54	.15
	Spanish, Italian, and Portuguese	*52*	*47*	*47*	*41*	*54*	*45*	*41*
066.	Washington University-Saint Louis	6	5	4	NA	NA	NA	NA
	Romance Languages	*40*	*41*	*43*				
067.	Washington, University of-Seattle	10	NA	NA	NA	NA	NA	NA
	Romance Language and Literature	*50*						
068.	Wisconsin, University of-Madison	15	46	64	.60	10.4	.60	.28
	Spanish and Portuguese	*62*	*88*	*65*	*78*	*43*	*50*	*51*
069.	Yale University	10	16	28	.39	6.5	.56	.38
	Spanish and Portuguese	*50*	*54*	*52*	*62*	*64*	*47*	*59*

* indicates program was initiated since 1970.

NOTE: On the first line of data for every program, raw values for each measure are reported; on the second line values are reported in standardized form, with mean = 50 and standard deviation = 10. "NA" indicates that the value for a measure is not available.

TABLE 11.1 Program Measures (Raw and Standardized Values) in Spanish Lang. & Lit.

Prog	Survey Results				University Library	Survey Ratings Standard Error			
No.	(08)	(09)	(10)	(11)	(12)	(08)	(09)	(10)	(11)
061.	1.9	1.1	1.4	1.0	NA	.12	.10	.09	.07
	40	*38*	*67*	*45*					
062.	4.1	2.3	1.1	1.6	1.6	.08	.05	.08	.05
	69	*68*	*52*	*67*	*63*				
063.	2.2	1.3	0.9	1.0	-1.0	.10	.08	.08	.07
	43	*43*	*47*	*45*	*36*				
064.	2.5	1.6	1.0	1.0	-0.7	.11	.08	.06	.06
	48	*48*	*51*	*46*	*39*				
065.	2.9	1.8	1.6	1.2	0.7	.10	.07	.07	.07
	53	*55*	*74*	*52*	*54*				
066.	2.0	1.3	0.8	1.2	-0.4	.12	.10	.08	.07
	41	*43*	*40*	*52*	*43*				
067.	2.8	1.7	0.9	1.2	1.5	.11	.08	.09	.07
	52	*53*	*46*	*50*	*62*				
068.	3.7	2.2	0.7	1.6	1.6	.09	.06	.07	.05
	63	*65*	*38*	*66*	*63*				
069.	4.1	2.2	1.1	1.7	2.1	.09	.06	.06	.04
	68	*65*	*54*	*70*	*68*				

NOTE: On the first line of data for every program, raw values for each measure are reported; on the second line values are reported in standardized form, with mean = 50 and standard deviation = 10. "NA" indicates that the value for a measure is not available.

TABLE 11.2 Summary Statistics Describing Each Program Measure--Spanish Language & Literature

Measure	Number of Programs Evaluated	Mean	Standard Deviation	DECILES 1	2	3	4	5	6	7	8	9
Program Size												
01 Raw Value	69	10	4	6	7	7	9	9	10	11	13	15
Std Value	69	50	10	40	43	43	47	47	50	52	57	62
02 Raw Value	64	13	9	5	6	6	8	10	13	15	17	26
Std Value	64	50	10	41	42	42	45	47	50	53	55	65
03 Raw Value	65	24	27	6	8	10	15	17	21	24	31	45
Std Value	65	50	10	43	44	45	47	48	49	50	53	58
Program Graduates												
04 Raw Value	37	.24	.13	.05	.13	.15	.19	.25	.27	.31	.33	.39
Std Value	37	50	10	35	42	43	46	51	52	55	57	62
05 Raw Value	37	9.0	1.8	11.0	10.6	10.1	9.8	8.8	8.5	8.0	7.8	7.0
Std Value	37	50	10	39	41	44	46	51	53	56	57	61
06 Raw Value	36	.60	.14	.41	.47	.52	.54	.56	.62	.68	.73	.78
Std Value	36	50	10	36	41	44	46	47	51	56	59	63
07 Raw Value	36	.27	.12	.10	.16	.19	.21	.24	.31	.33	.36	.42
Std Value	36	50	10	36	41	43	45	48	53	55	58	63
Survey Results												
08 Raw Value	69	2.7	.8	1.7	2.0	2.1	2.3	2.5	2.8	3.1	3.4	3.7
Std Value	69	50	10	38	42	43	45	48	52	56	60	64
09 Raw Value	69	1.6	.4	1.1	1.2	1.4	1.5	1.6	1.7	1.9	2.0	2.2
Std Value	69	50	10	37	39	44	47	49	52	57	60	65
10 Raw Value	69	1.0	.2	.7	.8	.9	.9	1.0	1.0	1.1	1.2	1.3
Std Value	69	50	10	38	42	46	46	50	50	55	59	63
11 Raw Value	69	1.1	.3	.7	.9	1.0	1.1	1.1	1.2	1.3	1.4	1.5
Std Value	69	50	10	35	42	45	49	49	52	56	59	62
University Library												
12 Raw Value	63	.3	1.0	-.9	-.6	-.4	-.2	.2	.4	.8	1.1	1.8
Std Value	63	50	10	37	40	42	44	49	51	55	58	65

NOTE: Standardized values reported in the preceding table have been computed from exact values of the mean and standard deviation and not the rounded values reported here.

TABLE 11.3 Intercorrelations Among Program Measures on 69 Programs in Spanish Language & Literature

	Measure											
	01	02	03	04	05	06	07	08	09	10	11	12
Program Size												
01		.46	.46	.07	-.27	.16	.18	.42	.46	.36	.30	.42
02			.53	.30	-.27	.08	.10	.42	.48	-.13	.37	.42
03				-.21	-.58	.19	.04	.22	.22	.07	.06	.37
Program Graduates												
04					.26	-.14	.09	.38	.42	-.02	.48	.29
05						-.24	.18	.37	.38	-.17	.47	.16
06							.62	-.18	-.12	.22	-.22	-.08
07								.15	.17	.01	.13	.08
Survey Results												
08									.97	.28	.93	.70
09										.28	.90	.70
10											.23	.14
11												.67
University Library												
12												

NOTE: Since in computing correlation coefficients program data must be available for both of the measures being correlated, the actual number of programs on which each coefficient is based varies.

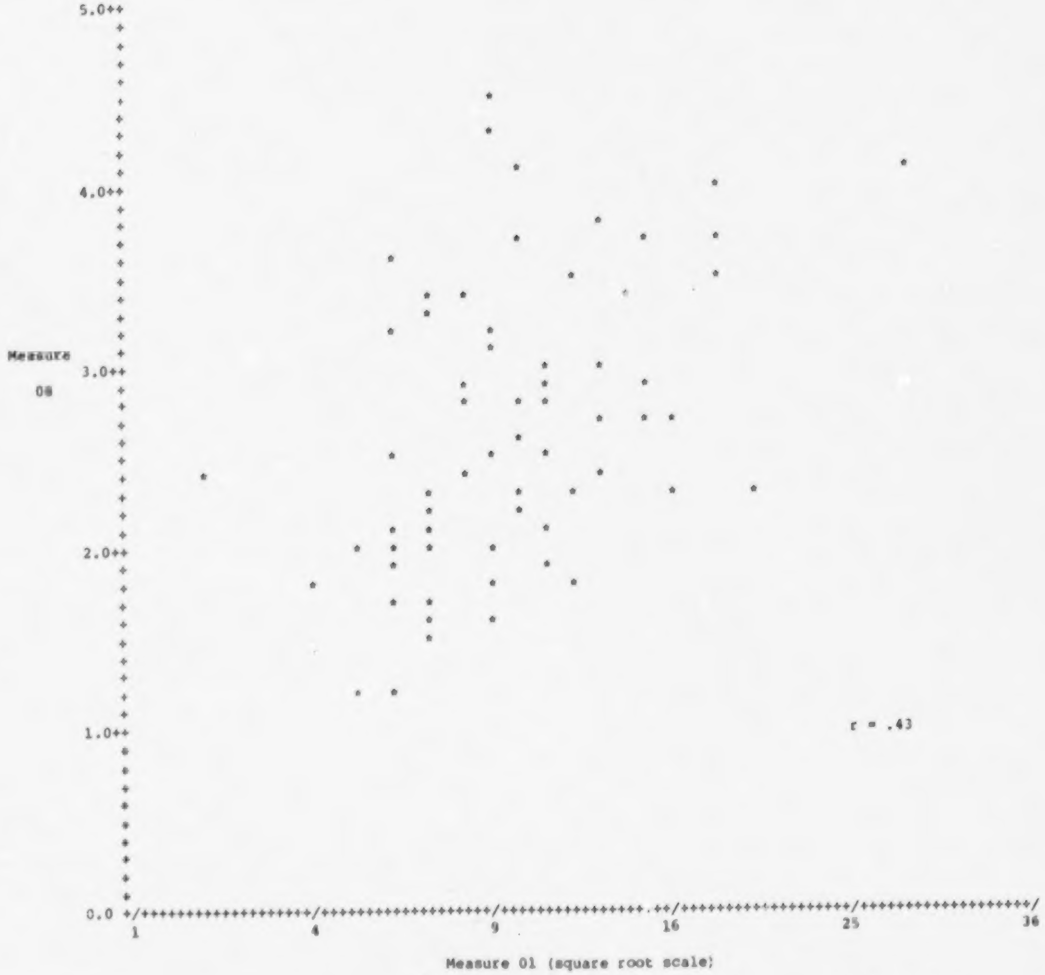

FIGURE 11.1 Mean rating of scholarly quality of faculty (measure 08) versus number of faculty members (measure 01)--69 programs in Spanish language & literature.

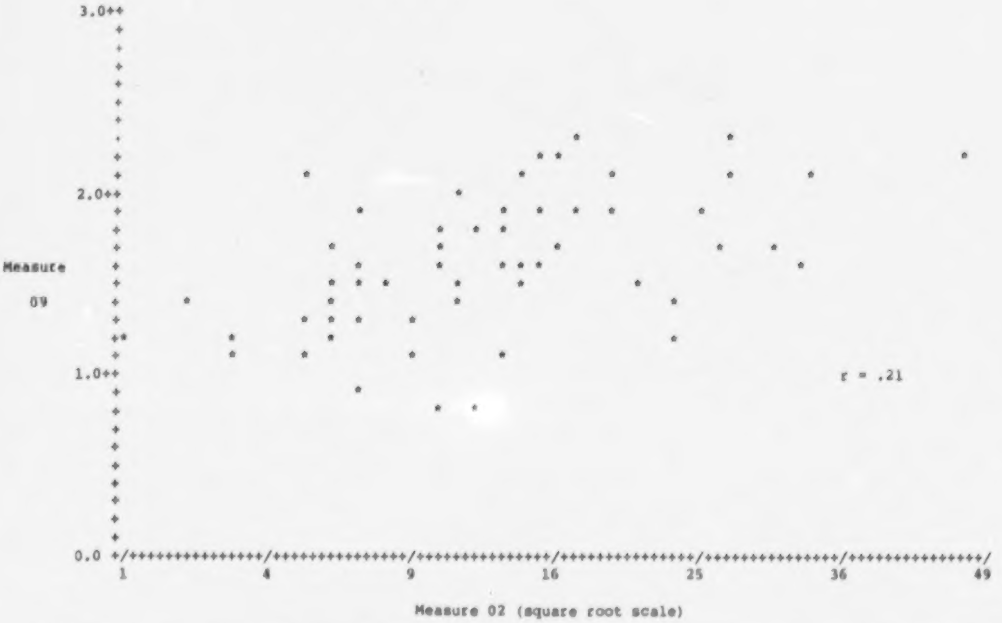

FIGURE 11.2 Mean rating of program effectiveness in educating research scholars/scientists (measure 09) versus number of graduates in last five years (measure 02)--64 programs in Spanish language & literature.

TABLE 11.4 Characteristics of Survey Participants in Spanish Language & Literature

	Respondents	
	N	%
Field of Specialization		
Spanish/Portuguese Lang. & Lit.	125	92
Other/Unknown	11	8
Faculty Rank		
Professor	74	54
Associate Professor	46	34
Assistant Professor	16	12
Year of Highest Degree		
Pre-1950	7	5
1950-59	32	24
1960-69	53	39
Post-1969	41	30
Unknown	3	2
Evaluator Selection		
Nominated by Institution	114	84
Other	22	16
Survey Form		
With Faculty Names	125	92
Without Names	11	8
Total Evaluators	136	100

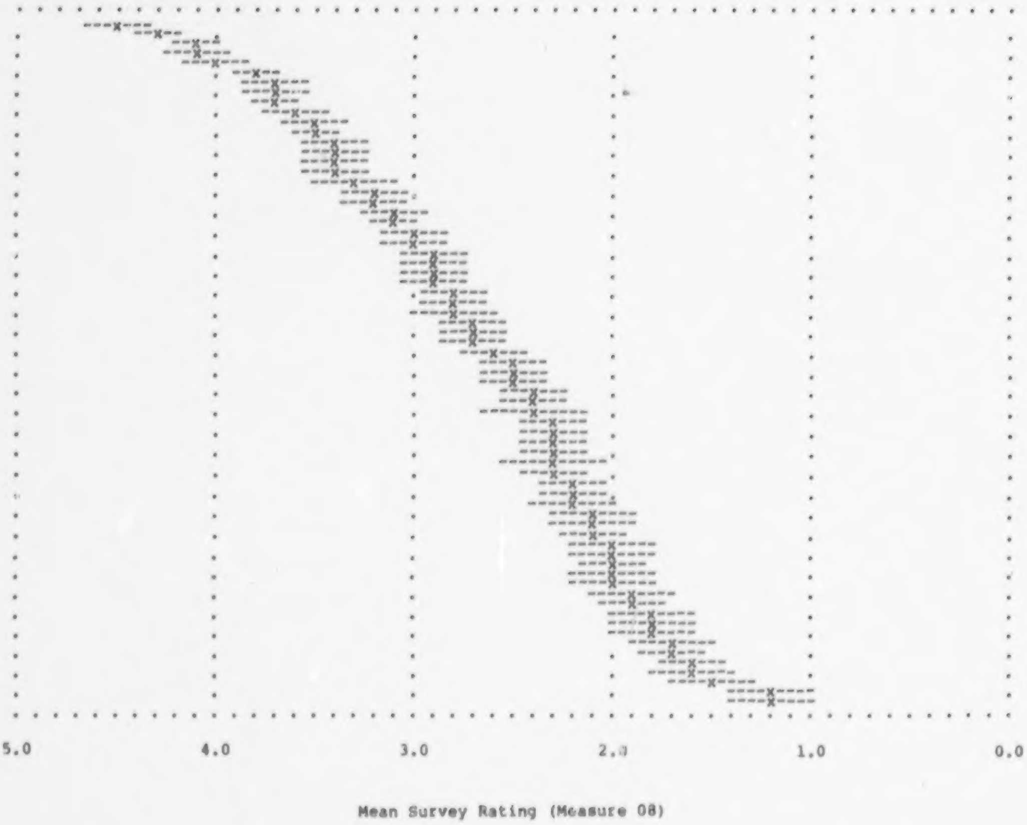

FIGURE 11.3 Mean rating of scholarly quality of faculty in 69 programs in Spanish language & literature.

NOTE: Programs are listed in sequence of mean rating, with the highest-rated program appearing at the top of the page. The broken lines (---) indicate a confidence interval of ±1.5 standard errors around the reported mean (x) of each program.

XII
Summary and Discussion

In the nine preceding chapters results are presented of the assessment of 522 research-doctorate programs in art history, classics, English language and literature, French language and literature, German language and literature, linguistics, music, philosophy, and Spanish language and literature. Included in each chapter are summary data describing the means and intercorrelations of the program measures in a particular discipline. In this chapter a comparison is made of the summary data reported in the nine disciplines. Also presented here are an analysis of the reliability (consistency) of the reputational survey ratings and an examination of some factors that might possibly have influenced the survey results. This chapter concludes with suggestions for improving studies of this kind--with particular attention given to the types of measures one would like to have available for an assessment of research-doctorate programs.

This chapter necessarily involves a detailed discussion of various statistics (means, standard deviations, correlation coefficients) describing the measures. Throughout, the reader should bear in mind that all these statistics and measures are necessarily imperfect attempts to describe the real quality of research-doctorate programs. Quality and some differences in quality are real, but these differences cannot be subsumed completely under any one quantitative measure. For example, no single numerical ranking--by measure 08 or by any weighted average of measures--can rank the quality of different programs with precision.

However, the evidence for reliability indicates considerable stability in the assessment of quality. For instance, a program that comes out in the first decile of a ranking is quite unlikely to "really" belong in the third decile, or vice versa. If numerical ranks of programs were replaced by groupings (distinguished, strong, etc.), these groupings again would not fully capture actual differences in quality since there would likely be substantial ambiguity about the borderline between adjacent groups. Furthermore any attempt at linear ordering (best, next best, . . .) may also be inaccurate. Programs of roughly comparable quality may be better in different ways, so that there simply is no one best--as will also be indicated in some of the numerical analyses. However, these difficulties of formulating ranks should not hide the underlying reality of differences in quality or the importance of high quality for effective doctoral education.

SUMMARY OF THE RESULTS

Displayed in Table 12.1 are the numbers of programs evaluated (bottom line) and the mean values for each measure in the nine humanities disciplines.[1] As can be seen, the mean values reported for individual measures vary considerably among disciplines. The pattern of means on each measure is summarized below, but the reader interested in a detailed comparison of the distribution of a measure may wish to refer to tables presented in the preceding chapters.[2]

Program Size (Measures 01-03). Based on the information provided to the committee by the study coordinator at each university, English programs had, on the average, the largest number of faculty members (31 in December 1980), followed by music (20). English programs graduated the most students (44 Ph.D. recipients in the FY1975-79 period) and had the largest enrollment (62 doctoral students in December 1980). In contrast, classics programs were reported to have an average of only 11 faculty members, 10 graduates, and 17 doctoral students.

Program Graduates (Measures 04-07). The mean fraction of FY1975-79 doctoral recipients who as graduate students had received some national fellowship or training grant support (measure 04) ranges from .12 for graduates of music programs to .36 for graduates in linguistics. With respect to the median number of years from first enrollment in a graduate program to receipt of the doctorate (measure 05), graduates in classics, linguistics, and philosophy typically earned their degrees more than a full year sooner than graduates in any other humanities discipline. In terms of employment status at graduation (measure 06), an average of 67 percent of the Ph.D. recipients from art history programs reported that they had made firm job commitments by the time they had completed requirements for their degree, contrasted with 48 percent of the program graduates in French. A mean of 35 percent of the art history graduates reported that they had made firm commitments to take positions in Ph.D.-granting institutions (measure 07), while only 19 percent of those in French had made such plans.

Survey Results (Measures 08-11). Differences in the mean ratings derived from the reputational survey are small. In all nine disciplines the mean rating of scholarly quality of program faculty

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[1] See Table 2.1 for a description of each of the measures and the units in which values of a measure are reported.

[2] The second table in each of the nine earlier chapters presents the standard deviation and decile values for each measure.

TABLE 12.1 Mean Values for Each Program Measure, by Discipline

	Art History	Classics	English	French	German	Linguistics	Music	Philosophy	Spanish
Program Size									
01	13	11	31	11	9	14	20	14	10
02	18	10	44	15	13	19	26	18	13
03	33	17	62	20	15	34	42	29	24
Program Graduates									
04	.32	.28	.20	.26	.28	.36	.12	.27	.24
05	9.3	7.7	9.1	9.2	8.9	7.9	10.0	7.9	9.0
06	.67	.58	.57	.48	.51	.62	.64	.57	.60
07	.35	.32	.20	.19	.25	.28	.24	.25	.27
Survey Results									
08	2.7	2.9	2.5	2.6	2.9	2.8	2.8	2.6	2.7
09	1.5	1.6	1.5	1.6	1.7	1.6	1.6	1.5	1.6
10	1.1	.9	1.0	1.0	.9	1.1	1.1	1.1	1.0
11	1.1	1.2	.9	1.0	1.2	1.2	1.0	1.1	1.1
University Library									
12	.7	1.0	.2	.5	.5	.8	.6	.3	.3
Total Programs	41	35	106	58	48	35	53	77	69

(measure 08) is slightly below 3.0 ("good"), and programs were judged to be, on the average, a bit below "moderately" effective (2.0) in educating research scholars/scientists (measure 09). In the opinions of the survey respondents, there has been "little or no change" (approximately 1.0 on measure 10) in the last five years in the overall average quality of programs. The mean rating of an evaluator's familiarity with the work of program faculty (measure 11) is close to 1.0 ("some familiarity") in every discipline--about which more will be said later in this chapter.

University Library (Measure 12). Measure 12, based on a composite index of the size[3] of the library in the university in which a program resides, is calculated on a scale from -2.0 to 3.0, with means ranging from .2 in English to .8 in linguistics, and 1.0 in classics. These differences may be explained, in large part, by the number of programs evaluated in each discipline. In the disciplines with fewest doctoral programs (classics and linguistics), the programs included are typically found in the larger institutions, which are likely to have high scores on the library size index. Ph.D. programs in English are found in a much broader spectrum of universities that includes the smaller institutions as well as the larger ones.

CORRELATIONS AMONG MEASURES

Relations among the program measures are of intrinsic interest and are relevant to the issue of validity of the measures as indices of the quality of a research-doctorate program. Measures that are logically related to program quality are expected to be related to each other. To the extent that they are, a stronger case might be made for the validity of each as a quality measure.

A reasonable index of the relationship between any two measures is the Pearson product-moment correlation coefficient. A table of correlation coefficients of all possible pairs of measures is presented in each of the nine preceding chapters. This chapter presents selected correlations to determine the extent to which coefficients are comparable in the nine disciplines. Special attention is given to the correlations involving the number of FY1975-79 program graduates (measure 02) and the survey rating of the scholarly quality of program faculty (measure 08). These two measures have been selected because of their relatively high correlations with several other measures. Readers interested in correlations other than those presented in Tables 12.2 and 12.3 may refer to the third table in each of the preceding nine chapters.

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[3] The index, derived by the Association of Research Libraries, reflects a number of different measures, including number of volumes, fiscal expenditures, and other factors relevant to the size of a university library. See the description of this measure presented in Appendix D.

Correlations with Measure 02. Table 12.2 presents the correlations of measure 02 with each of the other measures used in the assessment. As might be expected, correlations of this measure with the other two measures of program size--number of faculty and doctoral student enrollment--are reasonably high in all nine disciplines. Of greater interest are the strong positive correlations in many disciplines between measure 02 and measures derived from either reputational survey ratings or university library size. The coefficients describing the relationship of measure 02 with measure 12 are greater than .40 in all disciplines except linguistics and music. This result is not surprising, of course, since one might expect the larger programs to be located in the larger universities, which are likely to have libraries of considerable size. The correlations of measure 02 with measures 08, 09, and 11 are even stronger in most disciplines. It is quite apparent that the programs that received high survey ratings and with which evaluators were more likely to be familiar were also ones that had larger numbers of graduates. Although the committee gave serious consideration to presenting an alternative set of survey measures that were adjusted for program size, a satisfactory algorithm for making such an adjustment was not found. In attempting such an adjustment on the basis of the regression of survey ratings on measures of program size, it was found that some exceptionally large programs appeared to be unfairly penalized and that some very small programs received unjustifiably high adjusted scores.

Correlations with Measure 08. Table 12.3 shows the correlation coefficients for measure 08, mean rating of the scholarly quality of program faculty, with each of the other variables. The correlations of measure 08 with measures of program size (01, 02, and 03) are significantly positive for all of the humanities disciplines except music. Not surprisingly, the larger the program, the more likely its faculty is to be rated high in quality.

Correlations of measure 08 with measure 04, fraction of students with national fellowship awards, are .30 or higher in only four disciplines: English, linguistics, music, and Spanish. For programs in the biological and social sciences, the corresponding coefficients (reported in a subsequent volume) are found to be greater, typically in the range .40 to .70. The lower correlations in the humanities may be primarily explained by the smaller number of national fellowships available in these disciplines.

Correlations of rated faculty quality with measure 05, shortness of time from matriculation in graduate school to award of the doctorate, are positive in all nine humanities disciplines. Although the coefficents are not as high as those pertaining to program size (discussed above), they suggest that those programs producing graduates in shorter periods of time tended to receive higher survey ratings. This finding is surprising in view of the smaller correlations in these disciplines between measures of program size and shortness of time-to-Ph.D. It seems there is a tendency for programs that produce doctoral graduates in a shorter time span to have more highly rated faculty, and this tendency is relatively independent of the number of faculty.

TABLE 12.2 Correlations of the Number of Program Graduates (Measure 02) with Other Measures, by Discipline

	Art History	Classics	English	French	German	Linguistics	Music	Philosophy	Spanish
Program Size									
01	.72	.63	.65	.40	.44	.57	.54	.36	.46
03	.68	.58	.70	.67	.32	.74	.61	.50	.53
Program Graduates									
04	-.14	-.05	.01	-.14	-.24	-.10	-.02	-.02	.30
05	-.22	-.03	.21	.06	.03	-.34	-.03	.13	-.27
06	.33	.21	.02	-.11	.08	.03	.12	.19	.08
07	.13	.25	.21	.07	-.05	.05	-.17	.28	.10
Survey Results									
08	.76	.66	.68	.64	.58	.50	.12	.42	.42
09	.74	.72	.66	.67	.66	.53	.13	.45	.48
10	-.06	.07	.19	.02	.12	-.30	.08	-.23	-.13
11	.75	.61	.69	.63	.52	.49	.17	.43	.37
University Library									
12	.49	.44	.59	.51	.51	.12	.12	.49	.42

TABLE 12.3 Correlations of the Survey Ratings of Scholarly Quality of Program Faculty (Measure 08) with Other Measures, by Discipline

	Art History	Classics	English	French	German	Linguistics	Music	Philosophy	Spanish
Program Size									
01	.69	.81	.50	.57	.62	.51	-.02	.38	.42
02	.76	.66	.68	.64	.58	.50	.12	.42	.42
03	.52	.65	.58	.60	.41	.36	.17	.36	.22
Program Graduates									
04	.12	.10	.38	-.06	-.14	.33	.44	.24	.38
05	.36	.18	.47	.22	.24	.25	.17	.33	.37
06	.10	.34	.04	.00	.24	.49	-.26	.34	-.18
07	.08	.64	.54	.38	.50	.57	.28	.61	.15
Survey Results									
09	.99	.96	.98	.97	.98	.98	.99	.97	.97
10	.05	.31	.28	.45	.60	.29	.16	.20	.28
11	.98	.95	.98	.94	.97	.96	.94	.95	.93
University Library									
12	.54	.59	.71	.62	.65	.23	.73	.57	.70

Correlations of ratings of faculty quality with measure 06, the fraction of program graduates with definite employment plans, are moderately high in linguistics, classics, and philosophy. In every discipline except art history, the correlation of measure 08 is higher with measure 07, the fraction of graduates having agreed to employment at a Ph.D.-granting institution. These coefficients are .50 or greater in classics, philosophy, linguistics, English, and German.

The correlations of measure 08 with measure 09, rated effectiveness of doctoral education, are uniformly very high, at or above .96 in every discipline. This finding is consistent with results from the Cartter and Roose-Andersen studies.[4] The coefficients describing the relationship between measure 08 and measure 11, familiarity with the work of program faculty, are also very high, ranging from .93 to .98. In general, evaluators were more likely to have high regard for the quality of faculty in those programs with which they were most familiar. That the correlation coefficients are as large as observed may simply reflect the fact that "known" programs tend to be those that have earned strong reputations.

Correlations of ratings of faculty quality with measure 10, ratings of perceived improvement in program quality, are much smaller but still positive in all nine disciplines. The highest coefficients are found for programs in German (.60) and French (.45). One might have expected that a program judged to have improved in quality would have been somewhat more likely to receive high ratings on measure 08 than would a program judged to have declined--thereby imposing a small positive correlation between these two variables.

High correlations are also observed in most disciplines between measure 08 and measure 12 (university library size). With the exception of linguistics these coefficients are .50 or greater in all disciplines. It should be noted that the correlations between measure 08 and measure 12 are generally noticeably higher in the humanities disciplines than they are in science and engineering disciplines.

Despite the appreciable correlations between reputational ratings of quality and program size measures, the functional relations between the two probably are complex. If there is a minimum size for a high-quality program, this size is likely to vary from discipline to discipline. Increases in size beyond the minimum may represent more high-quality faculty, or a greater proportion of inactive faculty, or a faculty with heavy teaching responsibilities. In attempting to select among these alternative interpretations, a single correlation coefficient provides insufficient guidance. Nonetheless, certain similarities across disciplines may be seen in the correlations among the measures. High correlations consistently appear among measures 08, 09, and 11 from the reputational survey, and these measures also are prominently related to program size (measures 01, 02, and 03)--except in music--and to library size (measure 12)--except in linguistics. These results show that for most disciplines the reputational rating measures (08, 09, and 11) tend to be associated with program size and with another correlate of size: university library holdings. Also, for most disciplines the reputational measures 08, 09, and 11 tend to be positively related to shortness of time-to-Ph.D. (measure 05) and to employment prospects of program graduates (especially measure 07).

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[4] Roose and Andersen, p. 19.

ANALYSIS OF THE SURVEY RESPONSE

Measures 08-11, derived from the reputational survey, may be of particular interest to many readers since measures of this type have been the most widely used (and frequently criticized) indices of quality of graduate education. In designing the survey instrument for this assessment the committee made several changes in the form that had been used in the Roose-Andersen study. The modifications served two purposes: to provide the evaluators a clearer understanding of the programs that they were asked to judge and to provide the committee with supplemental information for the analysis of the survey response. One change was to restrict to 50 the number of programs that any individual was asked to evaluate--in art history, classics, German, and linguistics, evaluators were asked to consider all programs (except their own) since there were fewer than 50 in the total set being evaluated. Probably the most important change was the inclusion of lists of names and ranks of individual faculty members involved in the research-doctorate programs to be evaluated on the survey form, together with the number of doctoral degrees awarded in the previous five years. Ninety percent of the evaluators were sent forms with faculty names and numbers of degrees awarded; the remaining 10 percent were given forms without this information, so that an analysis could be made of the effect of this modification on survey results. Another change was the addition of a question concerning an evaluator's familiarity with each of the programs. In addition to providing an index of program recognition (measure 11), the inclusion of this question permits a comparison between the ratings furnished by individuals who had considerable familiarity with a particular program and the ratings by those not as familiar with the program. Each evaluator was also asked to identify his or her own institution of highest degree and current field of specialization. This information enables us to compare, for each program, the ratings furnished by alumni of that institution with the ratings by other evaluators, as well as to examine differences in the ratings supplied by evaluators in certain specialty fields.

Before examining factors that may have influenced the survey results, some mention should be made of the distributions of responses to the four survey items and the reliability (consistency) of the ratings. As can be seen from Table 12.4, the response distribution for each survey item does not vary greatly from discipline to discipline. For example, in judging the scholarly quality of faculty (measure 08), survey respondents in each discipline rated between 6 and 11 percent of the programs as being "distinguished" and between 3 and 5 percent as "not sufficient for doctoral education." In evaluat-

TABLE 12.4 Distribution of Responses to Each Survey Item, by Discipline

	Survey Measure	Total	Art History	Classics	English	French	German	Linguistics	Music	Philosophy	Spanish
08	SCHOLARLY QUALITY OF PROGRAM FACULTY										
	Distinguished	8.1	11.0	11.0	6.9	6.9	8.5	9.6	9.3	7.6	6.5
	Strong	17.8	15.5	24.1	15.1	16.6	2[illegible].9	20.6	19.7	15.5	17.4
	Good	23.3	23.3	23.7	20.6	23.5	26.8	25.1	19.7	22.5	26.1
	Adequate	18.6	17.4	17.1	17.5	20.3	17.8	18.8	12.8	19.4	22.5
	Marginal	9.7	9.0	9.1	9.6	9.6	8.8	9.4	7.9	10.8	10.6
	Not Sufficient for Doctoral Education	4.3	5.4	3.2	4.9	3.7	3.3	3.5	4.5	5.0	3.7
	Don't Know Well Enough to Evaluate	18.3	18.4	11.6	25.3	19.3	10.8	13.0	26.2	19.1	13.2
	TOTAL	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
09	EFFECTIVENESS OF PROGRAM IN EDUCATING SCIENTISTS										
	Extremely Effective	8.1	10.6	9.6	6.7	7.1	11.1	10.0	9.3	6.7	6.9
	Reasonably Effective	31.3	31.2	36.6	26.4	32.9	40.3	32.9	29.1	24.8	36.3
	Minimally Effective	17.1	19.5	19.9	13.9	16.7	18.9	16.3	18.0	14.6	20.8
	Not Effective	4.8	6.5	5.2	4.2	4.0	4.6	4.5	5.9	5.9	3.6
	Don't Know Well Enough to Evaluate	38.8	32.2	28.7	48.8	39.4	25.1	36.4	37.7	48.0	32.4
	TOTAL	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
10	CHANGE IN PROGRAM QUALITY IN LAST FIVE YEARS										
	Better	11.2	14.9	10.9	8.3	11.3	9.5	16.6	9.0	11.8	11.9
	Little or No Change	31.0	31.2	34.0	21.4	31.5	41.9	31.7	28.9	32.7	34.5
	Poorer	9.9	8.9	15.2	7.3	10.0	14.6	10.4	6.5	8.0	12.0
	Don't Know Well Enough to Evaluate	47.9	45.0	39.9	63.0	47.2	33.9	41.3	55.6	47.6	41.5
	TOTAL	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
11	FAMILIARITY WITH WORK OF PROGRAM FACULTY										
	Considerable	30.2	33.2	39.7	20.4	28.1	36.8	37.9	26.5	30.7	33.0
	Some	43.8	40.4	43.7	44.2	44.6	45.8	41.3	41.6	42.6	46.9
	Little or None	25.1	24.5	16.3	34.5	26.9	16.7	20.4	29.7	26.2	18.6
	No Response	.9	1.9	.4	.9	.3	.7	.4	2.3	.5	1.4
	TOTAL	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

NOTE: For survey measures 08, 09, 10 the "don't know" category includes a small number of cases for which the respondents provided no response to the survey item.

ing the effectiveness in educating research scholars, they rated 7 to 11 percent of the programs as being "extremely effective" and approximatey 4 to 7 percent as "not effective." Of particular interest in this table are the frequencies with which evaluators failed to provide responses to measures 08, 09, and 10. Approximately 18 percent of the total number of evaluations requested for measure 08 were not furnished because survey respondents in the humanities felt that they were not familiar enough with a particular program to evaluate it. The corresponding percentages of "don't know" responses for measures 09 and 10 are considerably larger--39 and 48 percent, respectively--suggesting that survey respondents found it more difficult (or were less willing) to judge program effectiveness and change than to judge the scholarly quality of program faculty.

The large fractions of "don't know" responses are a matter of some concern. However, given the broad coverage of research-doctorate programs, it is not surprising that faculty members would be unfamiliar with many of the less distinguished programs. As shown in Table 12.5, survey respondents in each discipline were much more likely to furnish evaluations for programs with high reputational standing than they were for programs of lesser distinction. For example, for humanities programs that received mean ratings of 4.0 or higher on measure 08, as many as 97 percent of the evaluations requested on measure 08 were provided; 89 and 79 percent, respectively, were provided on measures 09 and 10. In contrast, the corresponding response rates for programs with mean ratings below 2.0 are much lower--66, 43, and 32 percent response on measures 08, 09, and 10, respectively.

Of great importance to the interpretation of the survey results is the reliability of the response. How much confidence can one have in the reliability of a mean rating reported for a particular program? In the second table in each of the preceding nine chapters, estimated standard errors associated with the mean ratings of every program are presented for all four survey items (measures 08-11). While there is some variation in the magnitude of the standard errors reported in every discipline, they rarely exceed .15 for any of the four measures and typically range from .05 to .10. For programs with higher mean ratings the estimated errors associated with these means are generally smaller--a finding consistent with the fact that survey respondents were more likely to furnish evaluations for programs with high reputational standing. The "split-half" correlations[5] presented in Table 12.6 give an indication of the overall reliability of the survey results in each discipline and for each measure. In the derivation of these correlations individual ratings of each program were randomly divided into two groups (A and B), and a separate mean rating was computed for each group. The last column in Table 12.6 reports the

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[5] For a discussion of the interpretation of "split-half" coefficients, see Robert L. Thorndike and Elizabeth Hagan, Measurement and Evaluation in Psychology and Education, John Wiley & Sons, New York, 1969, pp. 182-185.

TABLE 12.5 Survey Item Response Rates, by Discipline and Mean Rating on Measure 08

Survey Measure	Total	Art History	Classics	English	French	German	Linguistics	Music	Philosophy	Spanish
08 SCHOLARLY QUALITY OF PROGRAM FACULTY										
Mean Rating on Measure 08										
4.0 or Higher	97.1	99.3	98.1	98.1	99.0	97.5	99.7	87.6	96.3	99.2
3.0 - 3.9	93.3	93.0	95.4	93.2	94.0	94.2	98.9	82.6	92.5	94.7
2.0 - 2.9	81.3	81.3	88.6	73.9	80.1	86.2	90.0	73.1	81.2	84.5
Less than 2.0	65.7	64.7	72.5	57.8	63.4	79.6	60.0	58.1	67.1	78.3
09 EFFECTIVENESS OF PROGRAM IN EDUCATING SCIENTISTS										
Mean Rating on Measure 08										
4.0 or Higher	89.0	95.7	94.8	86.2	91.9	91.4	96.0	79.8	82.2	92.9
3.0 - 3.9	75.4	81.8	80.1	67.7	77.5	80.9	84.6	70.6	63.2	82.0
2.0 - 2.9	57.4	63.8	67.1	48.1	57.1	68.3	60.0	60.9	48.5	62.2
Less than 2.0	42.8	48.6	50.6	34.8	41.6	62.2	31.9	46.0	37.2	53.8
10 CHANGE IN PROGRAM QUALITY IN LAST FIVE YEARS										
Mean Rating on Measure 08										
4.0 or Higher	79.1	86.5	83.4	68.7	84.5	84.2	86.5	65.1	78.9	85.0
3.0 - 3.9	66.7	72.5	69.3	50.7	69.3	73.5	78.7	55.9	66.7	73.1
2.0 - 2.9	49.2	51.8	56.4	35.1	49.9	59.8	58.5	40.5	51.6	52.8
Less than 2.0	32.1	30.5	38.4	22.0	32.9	50.2	22.0	26.3	34.2	44.7

TABLE 12.6 Correlations Between Two Sets of Average Ratings from Two Randomly Selected Groups of Evaluators in the Humanities

MEASURE 08: SCHOLARLY QUALITY OF PROGRAM FACULTY

Discipline	Mean Rating		Std. Deviation		Correlation	
	Group A	Group B	Group A	Group B	N	r
Art History	2.66	2.68	1.17	1.12	41	.99
Classics	2.93	2.91	1.01	.98	35	.98
English	2.46	2.51	1.05	1.05	106	.98
French	2.62	2.61	.91	.91	58	.97
German	2.88	2.89	.93	.96	48	.99
Linguistics	2.78	2.73	1.03	1.04	35	.98
Music	2.78	2.81	1.00	1.02	53	.96
Philosophy	2.54	2.57	1.01	1.01	77	.98
Spanish	2.65	2.66	.75	.81	69	.96

MEASURE 09: EFFECTIVENESS OF PROGRAM IN EDUCATING SCHOLARS

Discipline	Mean Rating		Std. Deviation		Correlation	
	Group A	Group B	Group A	Group B	N	r
Art History	1.51	1.55	.63	.66	41	.97
Classics	1.62	1.60	.50	.55	35	.95
English	1.51	1.53	.55	.52	106	.94
French	1.59	1.59	.48	.49	58	.95
German	1.72	1.70	.50	.52	48	.97
Linguistics	1.61	1.59	.57	.55	35	.98
Music	1.54	1.59	.56	.56	53	.90
Philosophy	1.48	1.47	.53	.54	77	.95
Spanish	1.61	1.63	.40	.40	69	.94

MEASURE 10: IMPROVEMENT IN PROGRAM IN LAST FIVE YEARS

Discipline	Mean Rating		Std. Deviation		Correlation	
	Group A	Group B	Group A	Group B	N	r
Art History	1.09	1.11	.22	.22	41	.72
Classics	.94	.90	.22	.24	35	.68
English	.99	1.00	.26	.25	106	.66
French	1.01	1.01	.25	.27	58	.78
German	.91	.90	.22	.24	48	.85
Linguistics	1.08	1.05	.38	.40	35	.90
Music	1.05	1.03	.20	.22	53	.56
Philosophy	1.06	1.05	.32	.29	77	.88
Spanish	.97	1.02	.24	.26	69	.75

MEASURE 11: FAMILIARITY WITH WORK OF PROGRAM FACULTY

Discipline	Mean Rating		Std. Deviation		Correlation	
	Group A	Group B	Group A	Group B	N	r
Art History	1.08	1.10	.44	.43	41	.95
Classics	1.23	1.24	.38	.36	35	.95
English	.86	.86	.44	.43	106	.96
French	1.02	1.01	.39	.39	58	.95
German	1.19	1.22	.35	.35	48	.93
Linguistics	1.18	1.18	.48	.46	35	.97
Music	.98	.95	.36	.37	53	.93
Philosophy	1.06	1.03	.40	.41	77	.94
Spanish	1.14	1.15	.29	.30	69	.89

correlations between the mean program ratings of the two groups and is not corrected for the fact that the mean ratings of each group are based on only half rather than a full set of the responses.[6] As the reader will note, the coefficients reported for measure 08, scholarly quality of program faculty, are in the range of .96 to .99--indicating a high degree of consistency in evaluators' judgments. The correlations reported for measures 09 and 11, rated effectiveness of a program and evaluators' familiarity with a program, are somewhat lower but still at a level of .94 or higher in every discipline except music. Not surprisingly, the reliability coefficients for ratings of change in program quality in the last five years (measure 10) are considerably lower, ranging from .56 in music to .90 in linguistics. While these coefficients represent tolerable reliability, it is quite evident that the responses to measure 10 are not as reliable as the responses to the other three items.

Further evidence of the reliability of the survey responses is presented in Table 12.7. As mentioned in Chapter VI of the mathematical and physical science volume of the committee's report, 11 mathematics programs,[7] selected at random, were included on a second form sent to 178 survey respondents in this discipline, and 116 individuals (65 percent) furnished responses to the second survey. A comparison of the overall results of the two survey administrations (columns 2 and 4 in Table 12.7) demonstrates the consistency of the ratings provided for each of the 11 programs. The average, absolute observed difference in the two sets of mean ratings is less than 0.1 for each measure. Columns 6 and 8 of Table 12.7 report the results based on the responses of only those evaluators who had been asked to consider a particular program in both administrations of the survey. (For a given program approximately 40-45 percent of the 116 respondents to the second survey had been asked to evaluate that program in the prior survey.) It is not surprising to find comparable small differences in the mean ratings provided by this subgroup of evaluators.

Critics of past reputational studies have expressed concern about the credibility of reputational assessments when evaluators provide judgments of programs about which they may know very little. As already mentioned, survey participants in this study were offered the explicit alternative, "Don't know well enough to evaluate." This response option was quite liberally used for measures 08, 09, and 10, as is shown in Table 12.4. In addition, evaluators were asked to indicate their degree of familiarity with each program. Respondents reported "considerable" familiarity with an average of only one

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[6] To compensate for the smaller sample size the "split-half" coefficient may be adjusted using the Spearman-Brown formula: $r' = 2r/(1 + r)$. This adjustment would have the effect of increasing a correlation of .70, for example, to .82, a correlation of .80 to .89, a correlation of .90 to .95, and a correlation of .95 to .97.

[7] Mathematics is the only discipline in which results were obtained from two separate administrations of the survey.

TABLE 12.7 Comparison of Mean Ratings for 11 Mathematics Programs Included in Two Separate Survey Administrations

	Survey Measure	All Evaluators				Evaluators Rating the Same Program in Both Surveys			
		First		Second		First		Second	
		N	$\bar{X}$	N	$\bar{X}$	N	$\bar{X}$	N	$\bar{X}$
Program A	08	100	4.9	114	4.9	50	4.9	50	4.9
	09	90	2.7	100	2.8	42	2.7	43	2.7
	10	74	1.2	83	1.2	38	1.1	34	1.2
	11	100	1.6	115	1.6	50	1.5	50	1.6
Program B	08	94	4.6	115	4.6	48	4.6	50	4.5
	09	81	2.6	91	2.5	40	2.6	39	2.5
	10	69	1.0	82	1.0	37	1.0	36	0.9
	11	98	1.4	116	1.4	50	1.5	50	1.5
Program C	08	86	3.4	103	3.6	42	3.4	44	3.5
	09	56	2.0	66	2.1	28	2.1	29	2.0
	10	55	1.1	62	1.3	30	1.2	27	1.4
	11	99	1.0	116	1.1	50	1.1	50	1.0
Program D	08	74	3.0	93	3.0	37	2.8	38	2.9
	09	50	1.8	48	1.6	27	1.7	16	1.6
	10	46	1.4	52	1.5	24	1.4	23	1.5
	11	90	1.0	113	0.9	46	1.0	46	0.9
Program E	08	69	3.0	95	3.1	39	3.0	46	3.1
	09	40	1.8	60	1.9	25	1.8	30	1.8
	10	36	0.8	58	0.9	24	0.8	29	0.9
	11	96	0.8	115	0.9	52	0.9	52	1.0
Program F	08	63	2.9	90	3.0	26	3.0	32	3.1
	09	35	1.8	46	1.7	10	1.6	13	1.8
	10	32	1.1	43	1.1	11	1.3	12	1.2
	11	95	0.7	115	0.8	43	0.7	44	0.7
Program G	08	69	2.7	92	2.8	39	2.7	39	3.0
	09	35	1.7	45	1.6	17	1.7	19	1.7
	10	36	1.1	43	1.2	17	1.1	19	1.2
	11	85	0.9	116	0.8	46	0.9	46	0.9
Program H	08	58	2.2	73	2.5	36	2.2	37	2.4
	09	32	1.3	43	1.3	22	1.2	19	1.3
	10	30	1.5	39	1.5	20	1.7	17	1.4
	11	90	0.7	116	0.6	51	0.7	52	0.6
Program I	08	55	2.0	74	1.9	30	1.9	30	2.0
	09	33	1.0	41	0.9	19	1.0	18	0.8
	10	27	1.2	31	1.1	15	1.1	13	1.2
	11	99	0.5	115	0.5	50	0.5	50	0.5
Program J	08	51	1.5	67	1.5	26	1.4	28	1.4
	09	31	0.8	36	0.7	14	0.6	14	0.7
	10	26	1.2	23	1.1	14	1.2	12	1.3
	11	96	0.5	113	0.3	49	0.4	48	0.4
Program K	08	33	1.2	48	1.2	17	1.1	21	1.4
	09	19	0.8	21	0.5	11	0.6	8	0.4
	10	12	0.8	15	0.9	5	1.0	5	0.8
	11	99	0.2	114	0.2	48	0.2	47	0.2

program in every three. While this finding supports the conjecture that many program ratings are based on limited information, the availability of reported familiarity permits us to analyze how ratings vary as a function of familiarity.

This issue can be addressed in more than one way. It is evident from the data reported in Table 12.8 that mean ratings of the scholarly quality of program faculty tend to be higher if the evaluator has considerable familiarity with the program. There is nothing surprising or, for that matter, disconcerting about such an association. When a particular program fails to provoke more than vague images in the evaluator's mind, he or she is likely to take this as some indication that the program is not an extremely lustrous one on the national scene. While visibility and quality are scarcely the same, the world of research in higher education is structured to encourage high quality to achieve high visibility, so that any association of the two is far from spurious.

TABLE 12.8 Mean Ratings of Scholarly Quality of Program Faculty, by Evaluator's Familiarity with Work of Faculty

	MEAN RATINGS		CORRELATION	
	Considerable	Some/ Little	r	N
Art History	2.75	2.59	.97	41
Classics	3.05	2.78	.96	35
English	2.94	2.37	.87	106
French	2.84	2.50	.95	58
German	3.09	2.76	.97	48
Linguistics	3.09	2.60	.95	34
Music	2.98	2.67	.91	53
Philosophy	2.96	2.38	.92	77
Spanish	2.90	2.48	.94	69

NOTE: N reported in last column represents the number of programs with a rating from at least one evaluator in each of the two groups.

From the data presented in Table 12.8 it is evident that if mean ratings were computed on the basis of the responses of only those most familiar with programs, the values reported for individual programs would be increased. A largely independent question is whether a restriction of this kind would substantially change our sense of the relative standings of programs on this measure. Quite naturally, the answer depends in some degree on the nature of the restriction imposed. For example, if we exclude evaluations provided by those who confessed "little or no" familiarity with particular programs, then the revised mean ratings would be correlated at a level of at least .99 with the mean ratings computed using all of the data. (This similarity arises, in part, because only a small fraction of evaluations are given on the basis of no more than "little" familiarity with the program.)

The third column in Table 12.8 presents the correlation in each discipline between the array of mean ratings supplied by respondents claiming "considerable" familiarity and the mean ratings of those indicating "some" or "little or no" familiarity with particular programs. This coefficient is a rather conservative estimate of agreement since there is not a sufficient number of ratings from those with "considerable" familiarity to provide highly stable means. Were more such ratings available, one might expect the correlations to be higher. However, even in the form presented, the correlations, which are at least .91 in all disciplines except English, are high enough to suggest that the relative standing of programs on measure 08 is not greatly affected by the admixtures of ratings from evaluators who recognize that their knowledge of a given program is limited.

As mentioned previously, 90 percent of the survey sample members were supplied the names of faculty members associated with each program to be evaluated, along with the reported number of program graduates (Ph.D. or equivalent degrees) in the previous five years. Since earlier reputational surveys had not provided such information, 10 percent of the sample members, randomly selected, were given forms without faculty names or doctoral data, as a "control group." Although one might expect that those given faculty names would have been more likely than other survey respondents to provide evaluations of the scholarly quality of program faculty, consistently large differences were not found (see Table 12.9) between the two groups in their frequency of response to this survey item. (The reader may recall

TABLE 12.9 Item Response Rate on Measure 08, by Selected Characteristics of Survey Evaluators in the Humanities

	Total	Art History	Classics	English	French	German	Linguistics	Music	Philosophy	Spanish
EVALUATOR'S FAMILIARITY WITH PROGRAM										
Considerable	99.9	99.9	99.9	100.0	99.8	99.9	100.0	99.9	100.0	100.0
Some	98.0	97.4	98.7	97.3	97.9	99.3	98.6	97.2	97.9	98.2
Little or None	33.1	34.4	33.9	31.8	32.8	40.0	40.6	21.6	31.8	38.5
TYPE OF SURVEY FORM										
Names	82.5	82.6	88.7	75.9	81.4	88.7	89.5	72.6	82.0	87.5
No Names	73.7	72.5	86.0	64.0	71.5	96.1	65.8	82.8	68.9	79.1
INSTITUTION OF HIGHEST DEGREE										
Alumni	99.7	100.0	100.0	100.0	98.8	100.0	100.0	100.0	100.0	98.7
Nonalumni	81.5	81.3	88.1	74.4	80.4	89.1	86.7	73.4	80.7	86.6
EVALUATOR'S PROXIMITY TO PROGRAM										
Same Region	88.5	89.8	89.9	84.0	90.2	93.5	91.0	83.9	86.2	92.8
Outside Region	80.7	80.2	88.1	73.3	79.2	88.5	86.4	72.2	80.0	86.0

NOTE: The item response rate is the percentage of the total ratings requested from survey participants that included a response other than "don't know."

that the provision of faculty names apparently had a positive effect on survey sample members' willingness to complete and return their questionnaires in humanities disciplines.[*])

The mean ratings provided by the group furnished faculty names are generally lower than the mean ratings supplied by other respondents (see Table 12.10). Although the differences are small, they attract attention because they are reasonably consistent from discipline to discipline (except Spanish) and because the direction of the differences was not anticipated. After all, those programs more familiar to evaluators tended to receive higher ratings, yet when steps were taken to enhance the evaluator's familiarity, the resulting ratings are somewhat lower. One post hoc interpretation of this finding is that a program may be considered to have distinguished faculty if even only a few of its members are considered by the evaluator to be outstanding in their field. However, when a full list of program faculty is provided, the evaluator may be influenced by the number of individuals whom he or she could not consider to be distinguished. Thus, the presentation of these additional, unfamiliar names may occasionally result in a lower rating of program faculty.

However interesting these effects may be, one should not lose sight of the fact that they are small at best and that their existence does not necessarily imply that a program's relative standing on

TABLE 12.10 Mean Ratings of Scholarly Quality of Program Faculty, by Type of Survey Form Provided to Evaluator

	MEAN RATINGS		CORRELATION	
	Names	No Names	r	N
Art History	2.64	2.93	.92	41
Classics	2.89	3.18	.91	35
English	2.49	2.58	.91	105
French	2.61	2.70	.84	58
German	2.87	3.14	.91	48
Linguistics	2.73	3.18	.91	35
Music	2.78	2.85	.92	53
Philosophy	2.55	2.60	.93	77
Spanish	2.66	2.56	.86	69

NOTE: N reported in last column represents the number of programs with a rating from at least one evaluator in each of the two groups.

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[*] As shown in Table 2.3, the survey response rate for those furnished faculty names is approximately 6 percentage points higher than that for those not given this information.

measure 08 would differ much whichever type of survey form was used. Since only about 1 in 10 ratings was supplied without the benefit of faculty names, it is hard to establish any very stable picture of relative mean ratings of individual programs. However, the correlations between the mean ratings supplied by the two groups are reasonably high--ranging from .84 to .93 in the nine disciplines (see Table 12.10). Were these coefficients adjusted for the fact that the group furnished forms without names constituted only about 10 percent of the survey respondents they would be substantially larger. From this result it seems reasonable to conclude that differences in the alternative survey forms used are not likely to be responsible for any large-scale reshuffling in the reputational ranking of programs on measure 08. It also suggests that the inclusion of faculty names in the committee's assessment need not prevent comparisons of the results with those obtained from the Roose-Andersen survey.

Another factor that might be thought to influence an evaluator's judgment about a particular program is the geographic proximity of that program to the evaluator. There is enough regional traffic in academic life that one might expect proximate programs to be better known than those in distant regions of the country. This hypothesis may apply especially to the smaller and less visible programs and is confirmed by the survey results. For purposes of analysis programs were assigned to one of nine geographic regions[9] in the United States, and ratings of programs within an evaluator's own region are categorized in Table 12.11 as "nearby." Ratings of programs in any of the other eight regions were put in the "outside" group. Findings reported elsewhere in this chapter confirm that evaluators were more likely to provide ratings if a program was within their own region of the country,[10] and it is reasonable to imagine that the smaller and the less visible programs received a disproportionate share of their ratings either from evaluators within their own region or from others who for one reason or another were particularly familiar with programs in that region.

Although the data in Table 12.11 suggest that "nearby" programs were given higher ratings than those outside the evaluator's region, the differences in reported means are quite small and probably represent no more than a secondary effect that might be expected, because, as we have already seen, evaluators tended to rate higher those programs with which they were more familiar. Furthermore, the high correlations found between the mean ratings of the two groups indicate that the relative standings of programs are not dramatically influenced by the geographic proximity of those evaluating them.

Another consideration that troubles some critics is that large programs may be unfairly favored in a faculty survey because they are likely to have more alumni contributing to their ratings who, it would stand to reason, would be generous in the evaluations of their alma

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[9] See Appendix G for a list of the states included in each region.
[10] See Table 12.9.

TABLE 12.11 Mean Ratings of Scholarly Quality of Program Faculty, by Evaluator's Proximity to Region of Program

	MEAN RATINGS		CORRELATION	
	Nearby	Outside	r	N
Art History	2.81	2.70	.96	39
Classics	2.84	2.95	.98	33
English	2.55	2.50	.94	104
French	2.63	2.62	.86	57
German	3.06	2.94	.91	46
Linguistics	2.88	2.71	.97	31
Music	2.85	2.79	.92	50
Philosophy	2.65	2.57	.94	75
Spanish	2.70	2.66	.86	68

NOTE: N reported in last column represents the number of programs with a rating from at least one evaluator in each of the two groups.

maters. Information collected in the survey on each evaluator's institution of highest degree enables us to investigate this concern. The findings presented in Table 12.12 support the hypothesis that alumni provided generous ratings--with differences in the mean ratings (for measure 08) of alumni and nonalumni ranging from .25 to .80 in the nine disciplines. Given the appreciable differences between the ratings furnished by program alumni and other evaluators, one might ask how much effect this has had on the overall results of the survey. The answer is "very little." As shown in the table, only 33 of the 106 English programs evaluated in the survey received ratings from any alumnus; in classics and linguistics more than half of the programs were evaluated by one or more alumni.[11] Even in the latter two disciplines, however, the fraction of alumni providing ratings of a program is always quite small and should have had minimal impact on the overall mean rating of any program. To be certain that this was the case, mean ratings of the scholarly quality of faculty were recalculated for every humanities program--with the evaluations provided by alumni excluded. The results were compared with the mean scores based on a full set of evaluations. Out of the 522 humanities programs evaluated in the survey, no program had an observed difference as large as 0.2, and for 485 programs (92 percent) their mean ratings remain unchanged (to the nearest tenth of a unit). On

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[11] Because of the small number of alumni ratings in every discipline, the mean ratings for this group are unstable and therefore the correlations between alumni and nonalumni mean ratings are not reported.

TABLE 12.12 Mean Ratings of Scholarly Quality of Program Faculty, by Evaluator's Institution of Highest Degree

	MEAN RATINGS		NUMBER OF PROGRAMS WITH ALUMNI RATINGS
	Alumni	Nonalumni	N
Art History	4.11	3.64	16
Classics	3.75	3.49	21
English	4.03	3.36	33
French	3.46	3.21	23
German	3.82	3.32	24
Linguistics	3.95	3.41	18
Music	3.69	3.25	26
Philosophy	3.92	3.12	27
Spanish	3.58	2.99	32

NOTE: The pairs of means reported in each discipline are computed for a subset of programs with a rating from at least one alumnus, and are substantially greater than the mean ratings for the full set of programs in each discipline.

the basis of these findings the committee saw no reason to exclude alumni ratings in the calculation of program means.

Another concern that some critics have is that a survey evaluation may be affected by the interaction of the research interests of the evaluator and the area(s) of focus of the research-doctorate program to be rated. It is said, for example, that some narrowly focused programs may be strong in a particular area of research but that this strength may not be recognized by a large fraction of evaluators who happen to be unknowledgeable in this area. This is a concern more difficult to address than those discussed in the preceding pages since little or no information is available about the areas of focus of the programs being evaluated (although in certain disciplines the title of a department or academic unit may provide a clue). To obtain a better understanding of the extent to which an evaluator's field of specialty may have influenced the ratings he or she has provided, an analysis was made of ratings provided by evaluators in physics and statistics/biostatistics. In each discipline the survey participants were divided into two groups according to specialty field (as reported on the survey questionnaire). The results of the analysis, which are presented in the mathematical and physical science volume of the committee's report, indicate that there is a high degree of correlation in the mean ratings furnished by those in differing specialty fields within these two disciplines. Although one cannot conclude from these findings that an evaluator's specialty field has no bearing on how he or she rates a program, these findings do suggest that the relative standings of programs in physics and statistics/biostatistics would not be greatly altered if the ratings by either group were discarded.

INTERPRETATION OF REPUTATIONAL SURVEY RATINGS

It is not hard to foresee that results from this survey will receive considerable attention, through enthusiastic and uncritical reporting in some quarters and sharp castigation in others. The study committee understands the grounds for both sides of this polarized response but finds that both tend to be excessive. It is important to make clear how we view these ratings as fitting into the larger study of which they are a part.

The reputational results are likely to receive a disproportionate degree of attention for several reasons, including the fact that they reflect the opinions of a large group of faculty colleagues and that they form a bridge with earlier studies of graduate programs. But the results will also receive emphasis because they alone, among all of the measures, seem to address quality in an overall or global fashion. While most recognize that "objective" program characteristics (i.e., fellowship support, employment of graduates, or library size) have some bearing on program quality, probably no one would contend that a single one of these measures encompasses all that need be known about the quality of research-doctorate programs. Each is obviously no more than an indicator of some aspect of program quality. In contrast, the reputational ratings are global from the start because the respondents are asked to take into account many objective characteristics and to arrive at a general assessment of the quality of the faculty and effectiveness of the program. This generality has self-evident appeal.

On the other hand, it is wise to keep in mind that these reputational ratings are measures of perceived program quality rather than of "quality" in some ideal or absolute sense. What this means is that, just as for all of the more objective measures, the reputational ratings represent only a partial view of what most of us would consider quality to be; hence, they must be kept in careful perspective.

Some critics may argue that such ratings are positively misleading because of a variety of methodological artifacts or because they are supplied by "judges" who often know very little about the programs they are rating. The committee has conducted the survey in a way that permits the empirical examination of a number of the alleged artifacts and, although our analysis is by no means exhaustive, the general conclusion is that their effects are slight.

Among the criticisms of reputational ratings from prior studies are some that represent a perspective that may be misguided. This perspective assumes that one asks for ratings in order to find out what quality really is and that to the degree that the ratings miss the mark of "quintessential quality," they are unreal, although the quality that they attempt to measure is real. What this perspective misses is the reality of quality and the fact that impressions of quality, if widely shared, have an imposing reality of their own and therefore are worth knowing about in their own right. After all, these perceptions govern a large-scale system of traffic around the nation's graduate institutions--for example, when undergraduate students seek the advice of their professor concerning graduate programs that they might attend. It is possible that some professors put in this position disqualify themselves on grounds that they are not well informed about the relative merits of the programs being considered. Most faculty members, however, surely attempt to be helpful on the basis of impressions gleaned from their professional experience, and these assessments are likely to have major impact on student decision-making. In short, the impressions are real and have very real effects not only on students shopping for graduate schools but also on other flows, such as job-seeking young faculty and the distribution of research resources. At the very least, the survey results provide a snapshot of these impressions from discipline to discipline. Although these impressions may be far from ideally informed, they certainly show a strong degree of consensus within each discipline, and it seems safe to assume that they are more than passingly related to what a majority of keen observers might agree program quality is all about.

COMPARISON WITH RESULTS OF THE ROOSE-ANDERSEN STUDY

An analysis of the response to the committee's survey would not be complete without comparing the results with those obtained in the survey by Roose and Andersen 12 years earlier. Although there are obvious similarities in the two surveys, there are also some important differences that should be kept in mind in examining individual program ratings of the scholarly quality of faculty. Already mentioned in this chapter is the inclusion, on the form sent to 90 percent of the sample members in the committee's survey, of the names and academic ranks of faculty and the numbers of doctoral graduates in the previous five years. Other significant changes in the committee's form are the identification of the university department or academic unit in which each program may be found, the restriction of requesting evaluators to make judgments about no more than 50 research-doctorate programs in their discipline, and the presentation of these programs in random sequence on each survey form. The sampling frames used in the two surveys also differ. The sample selected in the earlier study included only individuals who had been nominated by the participating universities, while more than one-fourth of the sample in the committee's survey were chosen at random from full faculty lists. (Except for this difference the samples were quite similar--i.e., in terms of number of evaluators in each discipline and the fraction of senior scholars.[12])

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[12] For a description of the sample group used in the earlier study, see Roose and Andersen, pp. 28-31.

Several dissimilarities in the coverage of the Roose-Andersen and this committee's reputational assessments should be mentioned. The former included a total of 130 institutions that had awarded at least 100 doctoral degrees in two or more disciplines during the FY1958-67 period. The institutional coverage in the committee's assessment was based on the number of doctorates awarded in each discipline (as described in Chapter I) and covered a total population of 228 universities. Most of the universities represented in the present study but not the earlier one are institutions that offered research-doctorate programs in a limited set of disciplines. In the Roose-Andersen study, programs in Russian were rated, along with programs in the nine humanities disciplines evaluated in this assessment. The committee decided not to include Russian programs in its assessment--for reasons explained in Chapter I. Finally, in the Roose-Andersen study, only one set of ratings was compiled from each institution represented in a discipline, whereas in the committee's survey separate ratings were requested if a university offered more than one research-doctorate program in a given discipline (such is rarely the case in humanities disciplines). The consequences of these differences in survey coverage is not large in the humanities: in the committee's survey, evaluations were requested for a total of 522 research-doctorate programs in nine humanities disciplines, compared with 483 programs in the Roose-Andersen study in these same disciplines.

Figures 12.1-12.9 plot the mean ratings of scholarly quality of faculty in programs included in both surveys; sets of ratings are graphed for 26 programs in art history, 30 in classics, 82 in English, 49 in French, 36 in German, 26 in linguistics, 34 in music, 58 in philosophy, and 52 in Spanish. Since in the Roose-Andersen study programs were identified by institution and discipline (but not by department) the matching of results from this survey with those from the committee's survey is not precise. For universities represented in the latter survey by more than one program in a particular discipline, the mean rating for the program with the largest number of graduates (measure 02) is the only one plotted here. Although the results of both surveys are reported on identical scales, some caution must be taken in interpreting differences in mean ratings a program received in the two evaluations. It is impossible to estimate what effect all of the differences described above may have had on the results of the two surveys. Furthermore, one must remember that the reported scores are based on the opinions of different groups of faculty members and were provided at different time periods. In 1969, when the Roose-Andersen survey was conducted, graduate departments in most universities were still expanding and not facing the enrollment and budget reductions that many departments have had to deal with in recent years. Consequently, a comparison of the overall findings from the two surveys tells us nothing about how much graduate education has improved (or declined) in the past decade. Nor should the reader place much stock in any small differences in the mean ratings that a particular program may have received in the two surveys. On the other hand, it is of particular interest to note the high correlations between the results of the evaluations. For programs in art history,

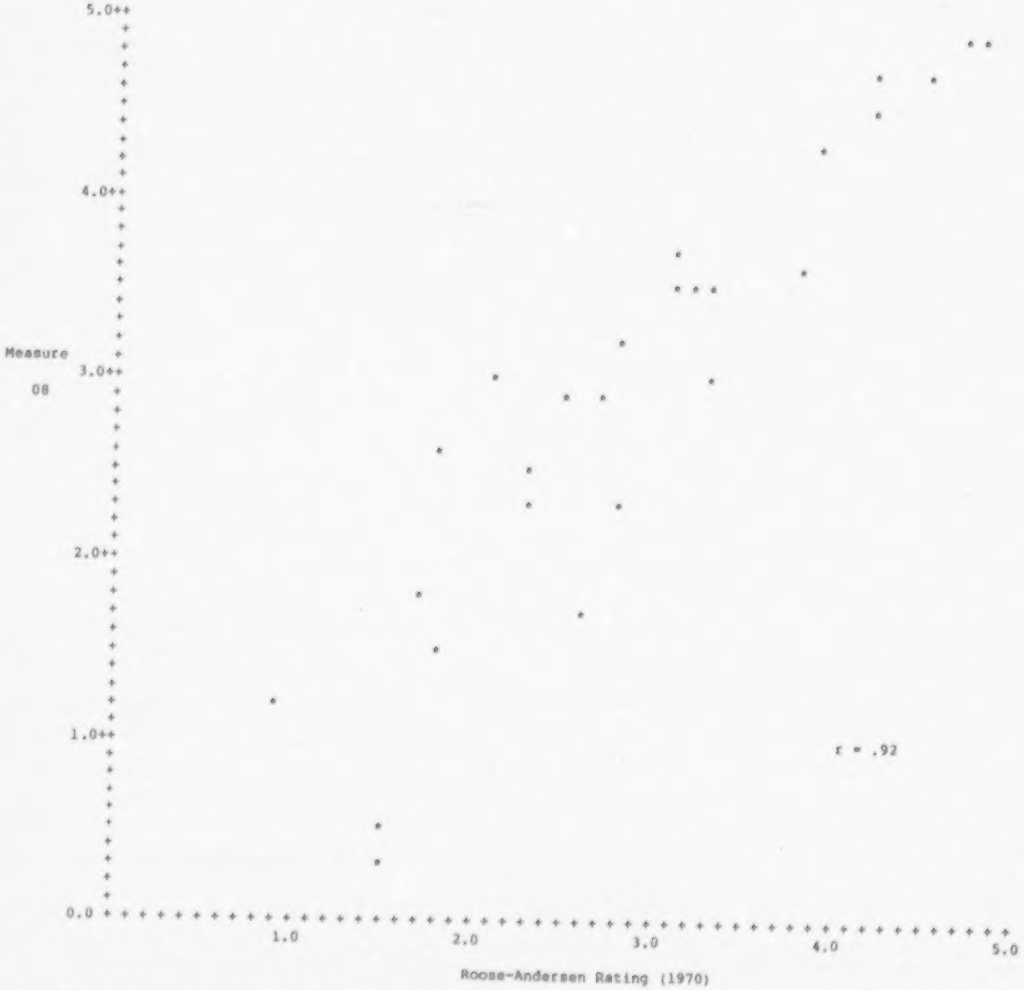

FIGURE 12.1 Mean rating of scholarly quality of faculty (measure 08) versus mean rating of faculty in the Roose-Andersen study--26 programs in art history.

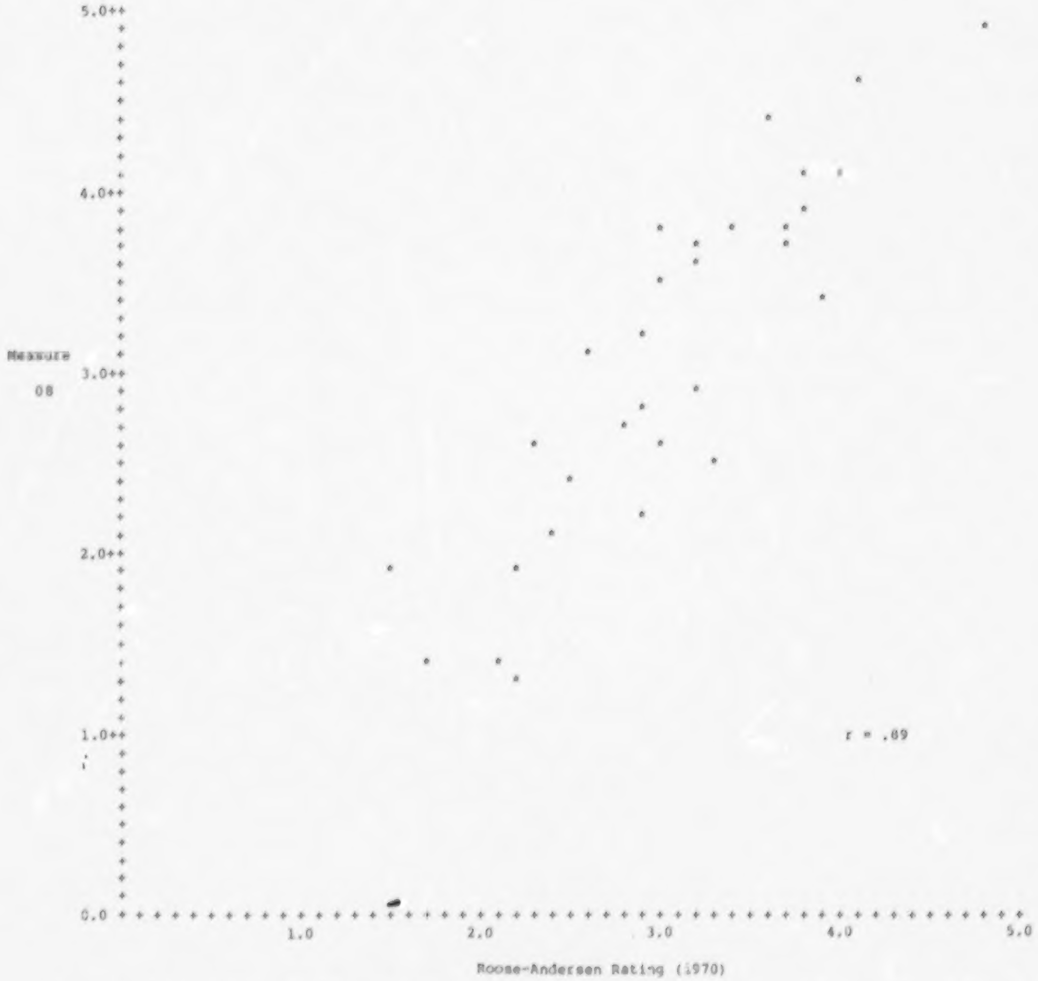

FIGURE 12.2 Mean rating of scholarly quality of faculty (measure 08) versus mean rating of faculty in the Roose-Andersen study--30 programs in classics.

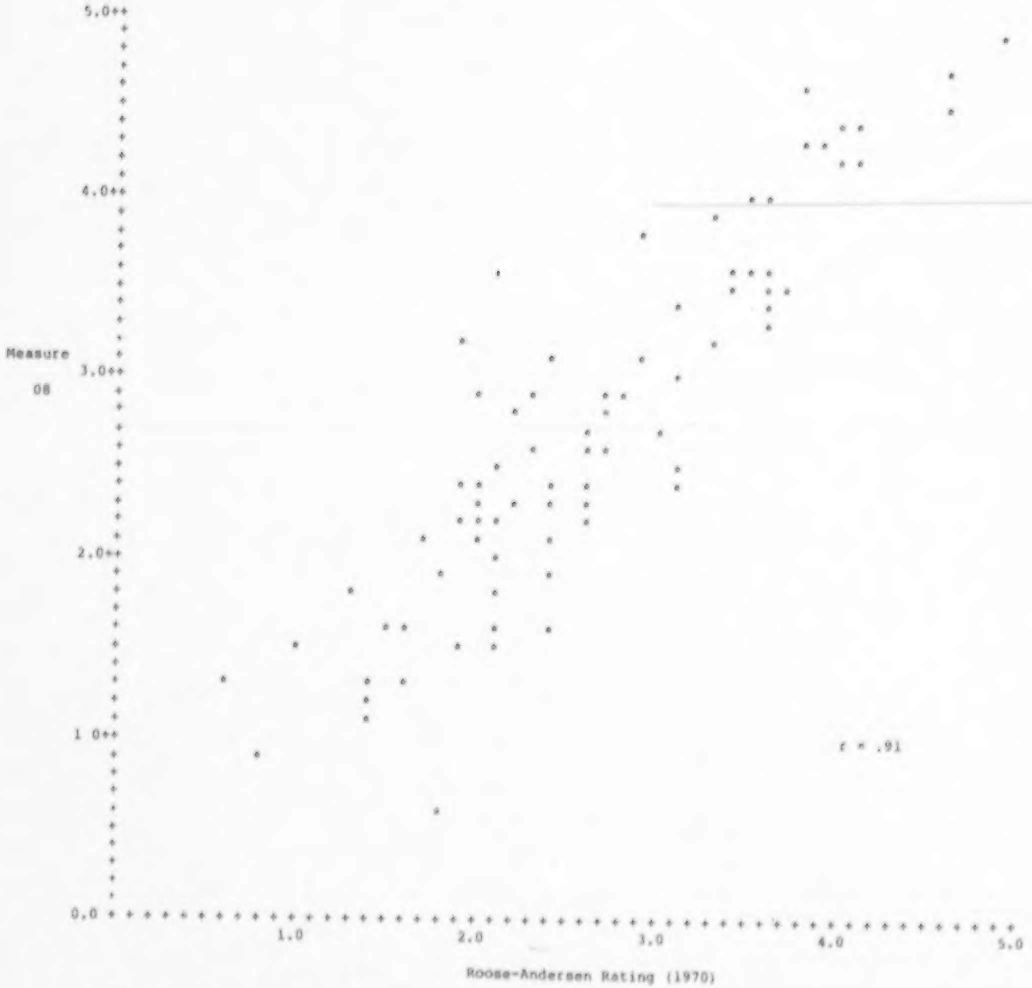

FIGURE 12.3 Mean rating of scholarly quality of faculty (measure 08) versus mean rating of faculty in the Roose-Andersen study--82 programs in English language & literature.

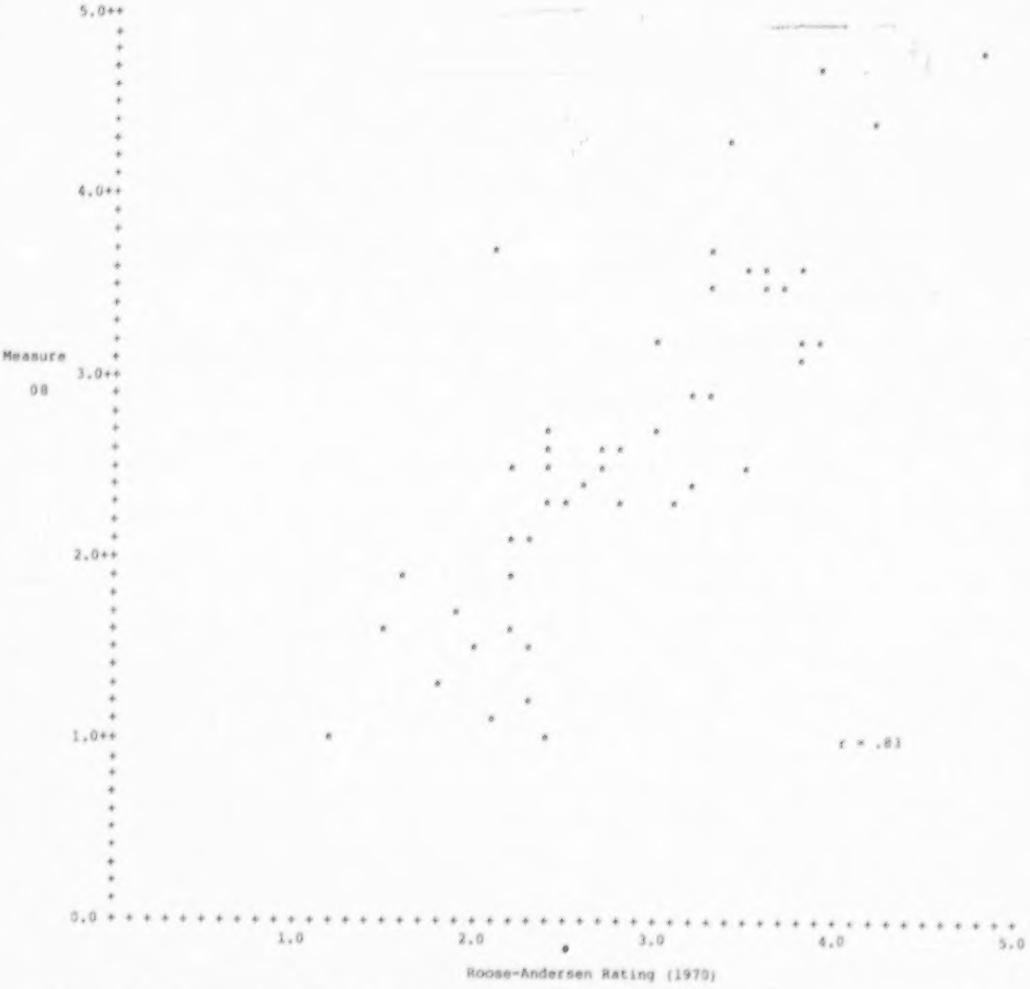

FIGURE 12.4 Mean rating of scholarly quality of faculty (measure 08) versus mean rating of faculty in the Roose-Andersen study--49 programs in French language & literature.

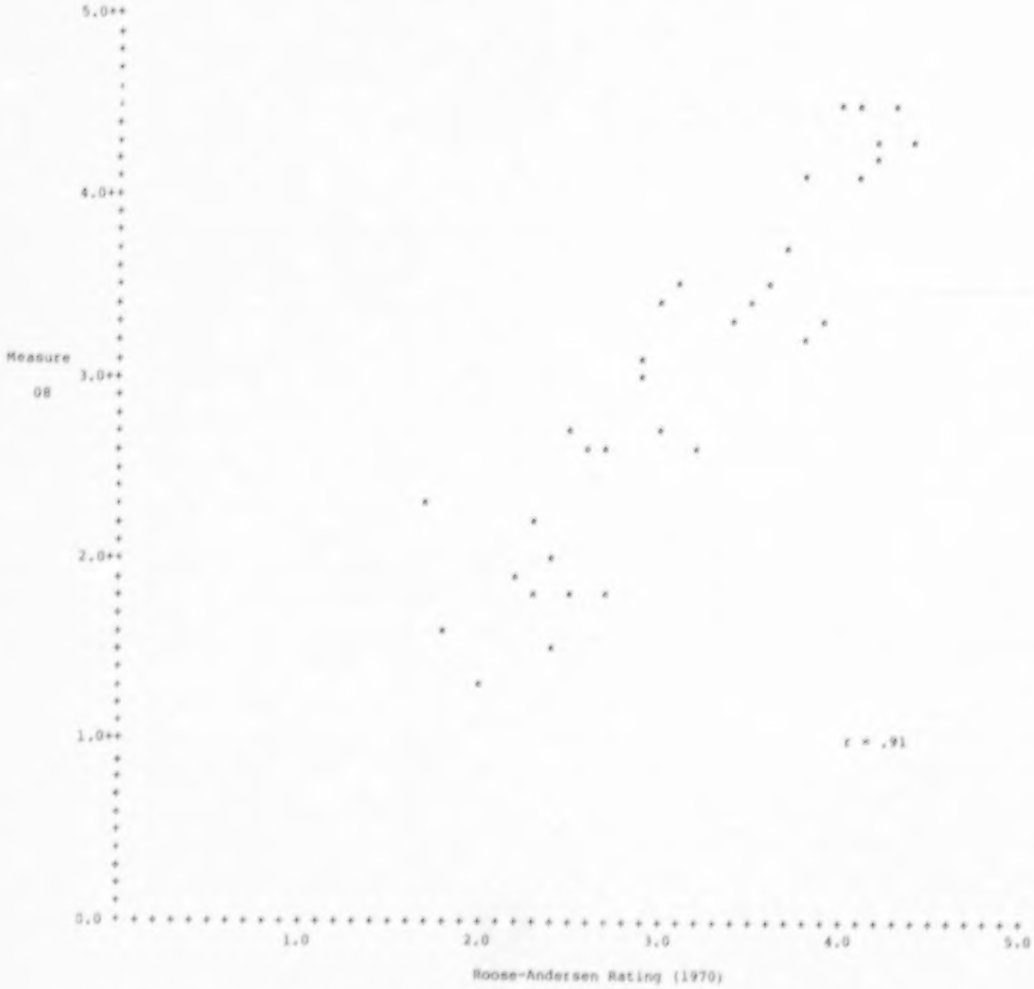

FIGURE 12.5 Mean rating of scholarly quality of faculty (measure 08) versus mean rating of faculty in the Roose-Andersen study--36 programs in German language & literature.

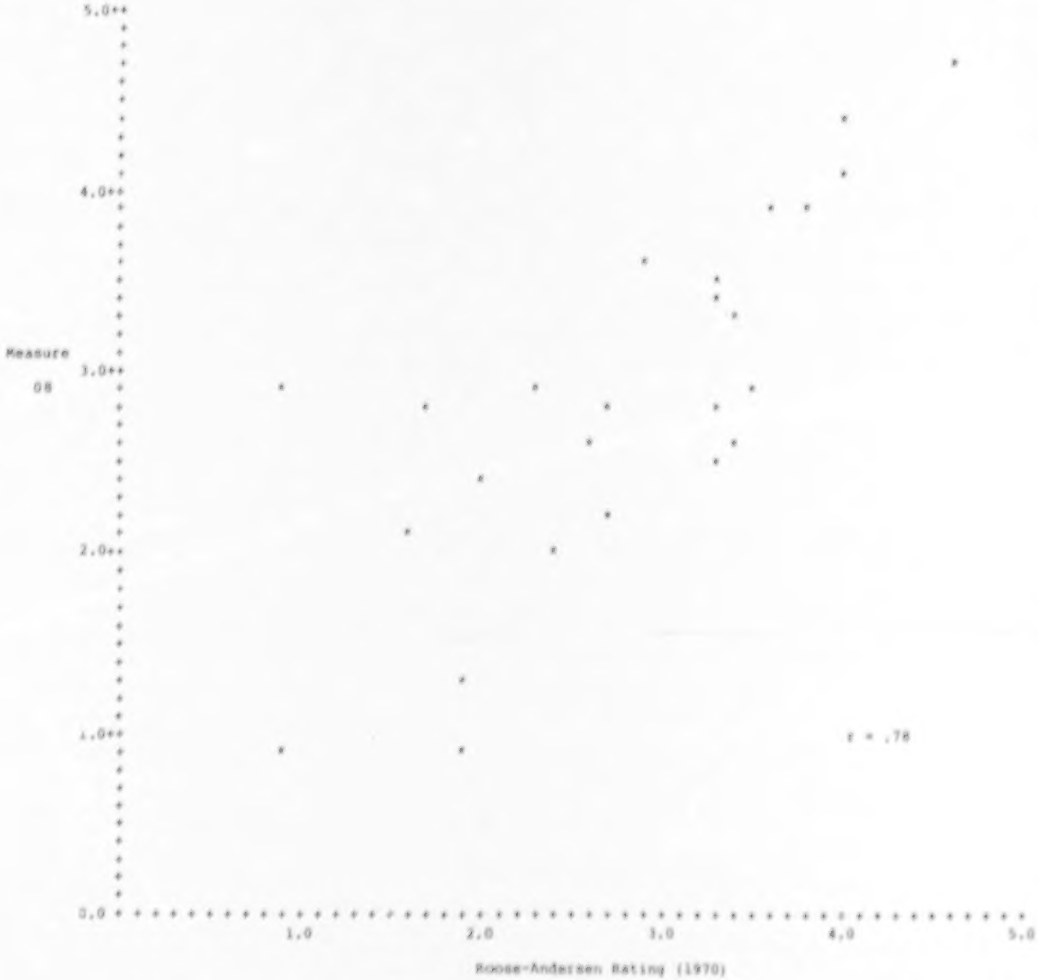

FIGURE 12.6 Mean rating of scholarly quality of faculty (measure 08) versus mean rating of faculty in the Roose-Andersen study--26 programs in linguistics.

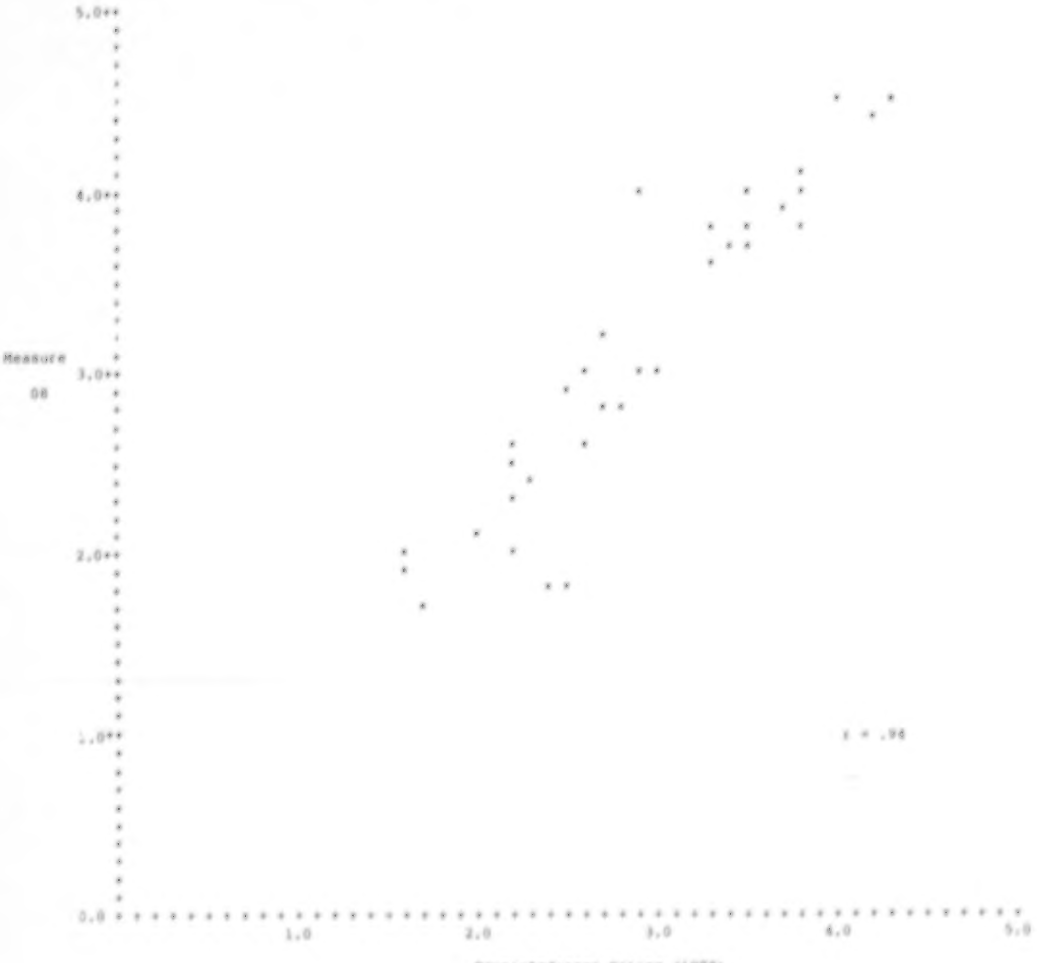

FIGURE 12.7 Mean rating of scholarly quality of faculty (measure 08) versus mean rating of faculty in the Roose-Andersen study--34 programs in music.

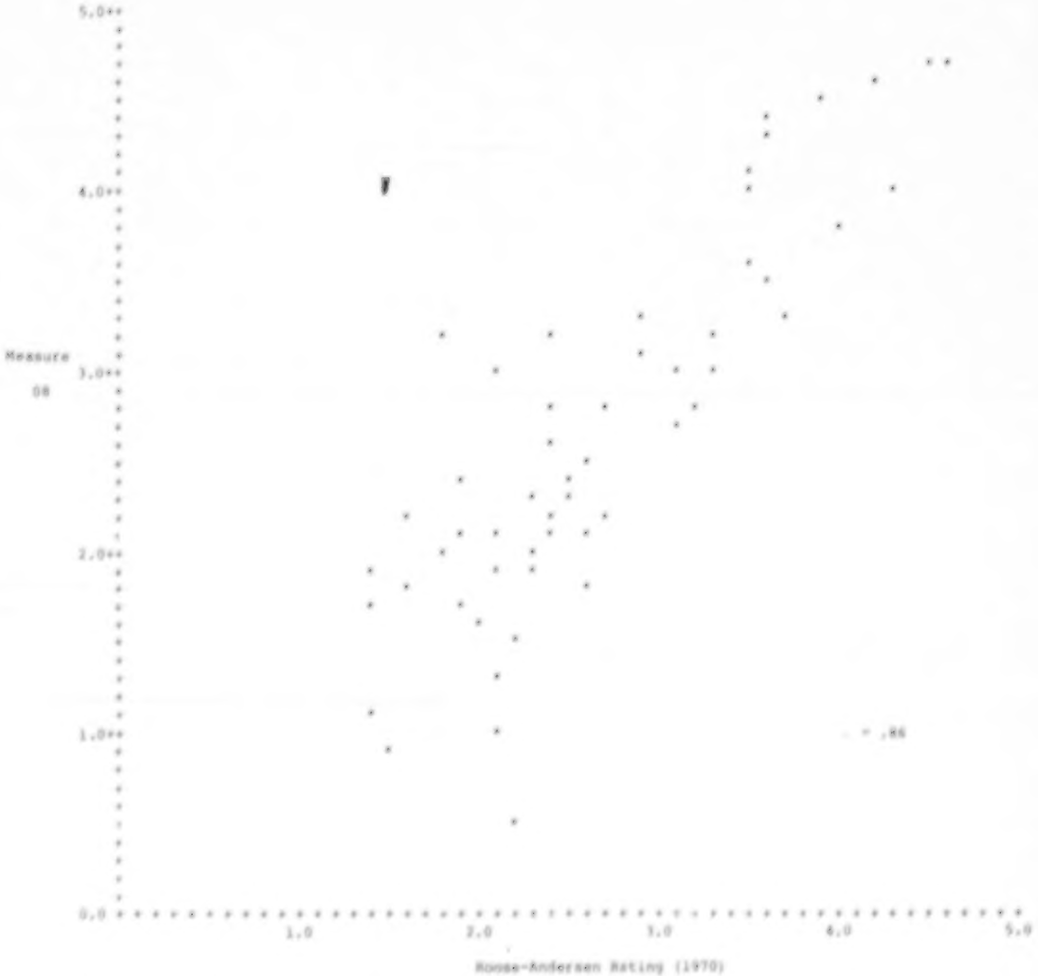

FIGURE 12.8 Mean rating of scholarly quality of faculty (measure 08) versus mean rating of faculty in the Roose-Andersen study--58 programs in philosophy.

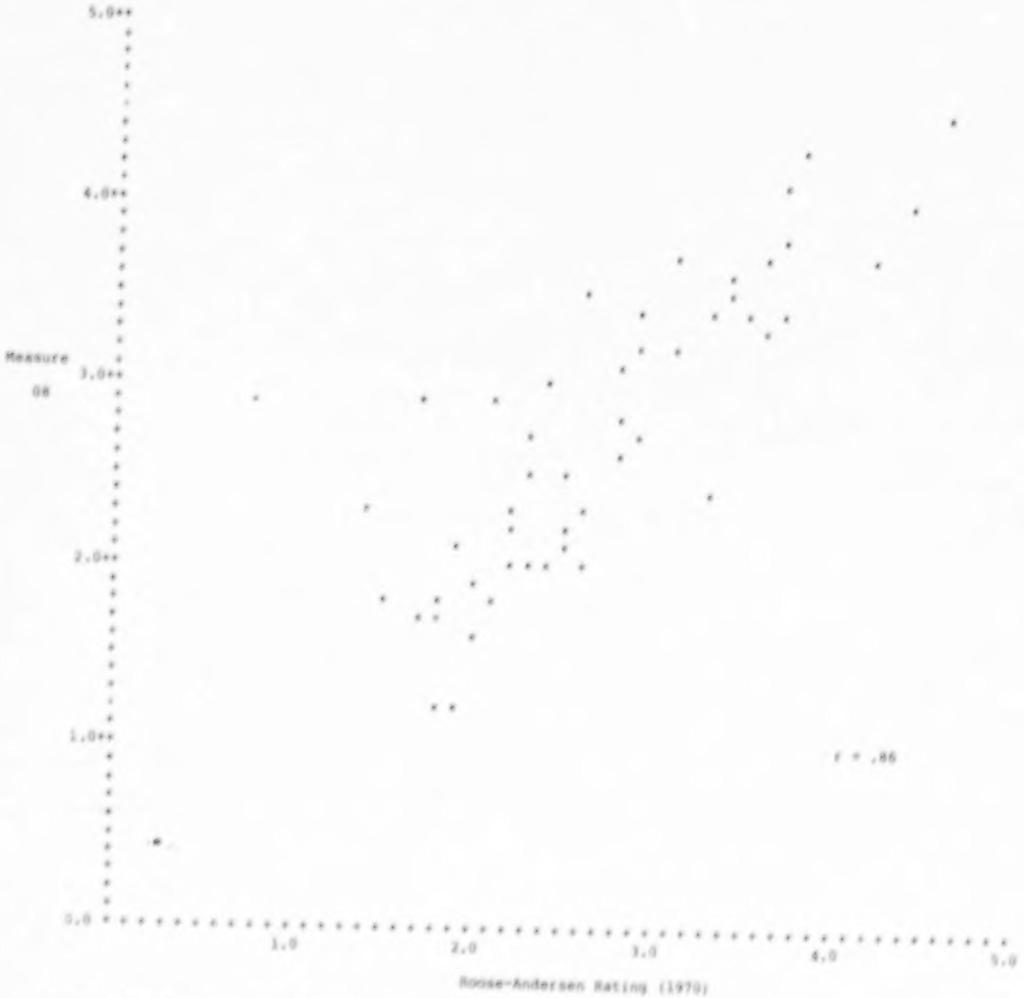

FIGURE 12.9 Mean rating of scholarly quality of faculty (measure 08) versus mean rating of faculty in the Roose-Andersen study--52 programs in Spanish language & literature.

English, German, and music the correlation coefficients are greater than .90. The lowest coefficient found is for programs in linguistics (.78). The extraordinarily high correlations found in most of these disciplines may suggest to some readers that reputational standings of programs have changed very little in the last decade. However, differences are apparent for some institutions. Also, one must keep in mind that the correlations are based on the reputational ratings of only three-fourths of the programs evaluated in this assessment in these disciplines and do not take into account the emergence of many new programs that did not exist or were too small to be rated in the Roose-Andersen study.

FUTURE STUDIES

One of the most important objectives in undertaking this assessment was to test new measures not used extensively in past evaluations of graduate programs. Although the committee believes that it has been successful in this effort, much more needs to be done. First and foremost, studies of this kind should be extended to cover other types of programs and other disciplines not included in this effort. As a consequence of budgeting limitations, the committee had to restrict its study to 32 disciplines, selected on the basis of the number of doctorates awarded in each. Among those omitted were programs in Russian, which was included in the Roose-Andersen study; a multidimensional assessment of research-doctorate programs in this and many other important disciplines would be of value. Consideration should also be given to embarking on evaluations of programs offering other types of graduate and professional degrees. As a matter of fact, plans for including masters-degree programs in this assessment were originally contemplated, but because of a lack of available information about the resources and graduates of programs at the master's level, it was decided to focus on programs leading to the research doctorate.

Perhaps the most debated issue the committee has had to address concerned which measures should be reported in this assessment. In fact, there is still disagreement among some of its members about the relative merits of certain measures, and the committee fully recognizes a need for more reliable and valid indices of the quality of graduate programs. First on a list of needs is more precise and meaningful information about the product of research-doctorate programs--the graduates. For example, what fraction of the program graduates have gone on to be productive scholars--either in the academic setting or outside the university environs? What fraction have gone on to become outstanding scholars--as measured by receipt of major prizes, membership in academies, and other such distinctions? How do program graduates compare with regard to their publication records? Also desired might be measures of the quality of the students applying for admittance to a graduate program (e.g., Graduate Record Examination scores, undergraduate grade point averages). If reliable data of this sort were made available, they might provide a useful index of the reputational standings of programs, from the perspective of graduate students.

A number of alternative measures relevant to the quality of program faculty were considered by the committee but not included in the assessment because of the associated difficulties and costs of compiling the necessary data. For example, what fraction of the program faculty were invited to present papers at national meetings? What fraction had been elected to prestigious organizations/groups in their field? What fraction had received senior fellowships and other awards of distinction? In addition, it would be highly desirable to compile information about research awards received by faculty members in humanities programs.

Minority Statement

The inclusion of several different and independent possible measures reflecting the quality of graduate education in this report seems to us a substantial addition and a significant improvement to previous such studies. However, we are concerned with the possibility that there are perhaps too many measures, some of which have little or no bearing on the objectives of the present study. In particular, measures 06 and 07 (on the employment plans of graduates) are not informative, have little or nothing to do with the quality of the program, and yield numbers that are not very dependable. Both measures come from data in the NRC's Survey of Earned Doctorates. Measure 06, the fraction of FY1975-79 program graduates with definite employment or study plans at time of doctorate, is vague because the "time of doctorate" may vary considerably from the time of year when, say, academic appointments are offered--and this in turn can vary substantially among institutions. This measure may be associated with the prosperity of the program, but its connection with quality is tenuous. Measure 07, the fraction of FY1975-79 program graduates planning to take positions in Ph.D.-granting universities, is even more nebulous. What is meant by "planning"? How firm are those plans? (We can't know; all there is is a check somewhere on a questionnaire.) What about the variation in quality among different Ph.D.-granting universities. It can be considerable, and such considerable differences are precisely those the whole study is attempting to measure. Such data obscure the differences. Further, measure 07 betrays the inherent bias of the present study and previous ones in that the "program graduates planning to take positions in Ph.D.-granting universities" is tacitly offered as a measure of the "goodness" of the program. In the late 1970's and 1980's nothing can be farther from the truth. The kindest evaluation of measures 06 and 07 is that they are irrelevant.

These two measures do not result from careful plans made by the committee for this study in order to find other useful new measures. Such plans were considered, but for various good reasons could not be carried out. These two particular measures just happen to be available in the vast data collected and recorded (but not critically evaluated) over the years by the Commission on Human Resources of the National Research Council. Their inclusion in this report might be explained by bureaucratic inertia, but this inclusion adds nothing to the report.

SAUNDERS MAC LANE

C. K. N. PATEL

ERNEST S. KUH

Appendixes

APPENDIX A

LETTER TO INSTITUTIONAL COORDINATORS

COMMITTEE ON AN ASSESSMENT OF QUALITY-RELATED CHARACTERISTICS
OF RESEARCH-DOCTORATE PROGRAMS IN THE UNITED STATES

Established by the Conference Board of Associated Research Councils

Office of the Staff Director / National Research Council / 2101 Constitution Avenue, N.W. / Washington, D.C. 20418

(202) 389-6552

December 5, 1980

Dear

We are pleased to learn that you have been designated to coordinate the efforts of your institution in assisting our committee with an assessment of the characteristics and effectiveness of research-doctorate programs in U.S. universities. A prospectus describing the goals and procedures for this study has already been distributed to university presidents and graduate deans. The cooperation of universities and their faculties is essential for the assessment to be carried out in an objective and accurate fashion.

The study is being conducted under the aegis of the Conference Board of Associated Research Councils and is housed administratively within the National Research Council. Financial support has been provided by the Andrew W. Mellon Foundation, the Ford Foundation, the National Science Foundation, and the National Institutes of Health. The study will examine more than 2,600 programs in 31 fields in the physical sciences, engineering, life sciences, social sciences, and humanities. Approximately 10,000 faculty members will be asked to evaluate programs in their own fields. In addition to the reputational evaluations by faculty, information will be compiled from national data banks on the achievements of both the faculty involved in each program and the program graduates.

The product of this study will be a series of reports with descriptive data on institutional programs in each of 31 fields to be covered. These reports will present several different measures of the quality-related characteristics of each program being evaluated. Some of the measures will be adjusted for program size. With the cooperation of your institution and that of other universities, we plan to produce these reports by late spring of 1982. At that time the detailed data that have

COMMITTEE MEMBERS

Lyle V. Jones, Co-Chairman
Gardner Lindzey, Co-Chairman
Paul A. Albrecht
Marcus Alexis
Robert M. Bock
Philip E. Converse
James H. M. Henderson
Ernest S. Kuh
Winfred P. Lehmann
Saunders Mac Lane
Nancy S. Milburn
Lincoln E. Moses
James C. Olson
Kumar Patel
Michael J. Pelczar, Jr.
Jerome B. Schneewind
Duane C. Spriestersbach
Harriet A. Zuckerman

been compiled on research-doctorate programs within your institution will be made available to you for a nominal cost. These data should prove to be quite valuable for an assessment of the particular strengths and weaknesses of individual programs at your institution.

For the past three months the committee has deliberated over what fields are to be covered in the study and which programs within each field are to be evaluated. The financial resources available limit us to an assessment of approximately 2,600 programs in 31 fields. The fields to be included have been determined on the basis of the total number of doctorates awarded by U.S. universities during the FY1976-78 period and the feasibility of identifying and evaluating comparable programs in a particular field. Within each of the 31 fields, programs which awarded more than a specified number of doctorates during the period have been designated for inclusion in the study.

For each of the programs at your institution that are to be evaluated, we ask that you furnish the names and ranks of all faculty members who participate significantly in education toward the research doctorate, along with some basic information (as indicated) about the program itself. A set of instructions and a computer-printed roster (organized by field) are enclosed. In addition, you are given an opportunity to nominate other programs at your institution that are not on the roster, but that you believe have significant distinction and should be included in our evaluation. Any program you nominate must belong in one of the 31 fields covered by the study.

The information supplied by your institution will be used for two purposes. First, a sample of the faculty members identified with each program will be selected to evaluate research-doctorate programs in their fields at other universities. The selection will be made in such a way as to ensure that all institutional programs and faculty ranks are adequately represented in each field category. Secondly, a list of names of faculty and some of the program information you supply will be provided to evaluators selected from other institutions. Thus, it is important that you provide accurate and up-to-date information. You may wish to ask department chairmen or other appropriate persons at your institution to assist in providing the information requested. If you do so, we ask that your office coordinate the effort by collecting the information on each program and sending a single package to us in the envelope provided.

We hope that you will be able to complete this request by December 15. Should you have any questions regarding our request, please call (collect) Porter Coggeshall, the study director, at (202)389-6552. Thank you for your help in this effort.

Sincerely,

Lyle V. Jones

Lyle V. Jones
Co-Chairman

Gardner Lindzey

Gardner Lindzey
Co-Chairman

INSTRUCTIONS

General Instructions

- Provided on the first page of the accompanying roster is a list of the 31 program fields to be covered in this study. Those program fields for which you are requested to furnish information have been designated with an asterisk (*).

- For every designated field there is a separate set of roster pages. Please provide all of the information requested on these pages.

- If your institution offers more than one research-doctorate program in a designated field, we ask that you copy the roster pages furnished for that field category and provide a separate set of information for each program. For example, if your university offers one doctoral program in statistics and another in biostatistics, these should be listed separately. For this purpose, programs offered by different departments (or other administative units) that are advertised as distinct programs in your catalogues would be listed separately. Do not consider different specialty areas within a department to be separate programs.

- If your institution currently does not offer a research-doctorate program in an asterisked field or if, in your judgment, a doctoral program offered fails to fit the designated field category, please so indicate on the roster pages provided for that field.

List of Faculty Members (as of December 1, 1980)

- On each program roster please provide the names of faculty members who participate significantly in doctoral education.

- Included should be individuals who (a) are members of the regular academic faculty (typically holding the rank of assistant, associate, or full professor) and (b) regularly teach doctoral students and/or serve on doctoral committees.

- Members of the faculty who are currently on leave of absence but meet the above criteria should be included.

- Visiting faculty members should not be included.

- Emeritus or adjunct faculty members (or faculty with other comparable ranks) should also be excluded unless they currently participate significantly in doctoral education.

- Members of the faculty who participate significantly in doctoral education in more than one program should be listed on the roster for each program in which they participate.

- In many instances the list of faculty for a program may be identical to an institutional list of graduate faculty.

- Faculty names should be provided in the form in which they are most likely to be recognized by colleagues in the field. We prefer that, within each academic rank, you list faculty alphabetically by last name.

Nomination of Faculty to Serve as Program Evaluators (Column 3 of Faculty Roster)

- Please check the names of at least two faculty members in each academic rank within each program who would be available and, in your opinion, well-qualified to evaluate research-doctorate programs in their field.

- A sample of evaluators will be selected from the list of faculty you provide for each program. In selecting evaluators preference will be given to those whose names you have checked. If no names are checked, a random sample will be selected from the faculty list.

Faculty Who Do Not Hold Ph.D. Degrees From U.S. Universities (Column 4 of Faculty Roster)

- In order to help us match the faculty names you provide with records in the Doctorate Records File (maintained by the National Research Council), we ask that you identify those faculty members who do not hold a Ph.D. or equivalent research-doctorate from a university in the United States.

- This information will be used only for the purposes of collating records and will not be released to those who are selected to evaluate your institution's programs. Nor will this information affect in any way the selection of program evaluators from your institution's faculty.

Nomination of Additional Programs

- We recognize the possibility that we may have omitted one or more research-doctorate programs at your institution that belong to (non-asterisked) fields listed on the first page of the roster and that you believe should be included in this study.

- The last two pages of the accompanying roster are provided for the nomination of an additional program. You are asked to provide the names of faculty and other information about each program you nominate. Should you decide to nominate more than one program, it will be necessary to make additional copies of these two pages of the roster.

- Please restrict your nominations to programs in your institution that you consider to be of uncommon distinction and that have awarded no fewer than two doctorates during the past two years.

- Only programs which fall under one of the 31 field categories listed on the first page of the accompanying roster will be considered for inclusion in the study.

PLEASE RETURN COMPLETED ROSTER IN
THE ENCLOSED ENVELOPE TO:

COMMITTEE ON AN ASSESSMENT OF
QUALITY-RELATED CHARACTERISTICS
OF RESEARCH-DOCTORATE PROGRAMS
NATIONAL RESEARCH COUNCIL, JH-711
2101 CONSTITUTION AVENUE, N.W.
WASHINGTON, D.C. 20418

FIELDS INCLUDED IN THE STUDY

ARTS AND HUMANITIES

* ART HISTORY
* CLASSICS
* ENGLISH LANGUAGE AND LITERATURE
* FRENCH LANGUAGE AND LITERATURE
* GERMAN LANGUAGE AND LITERATURE
LINGUISTICS
MUSIC
* PHILOSOPHY
* SPANISH AND PORTUGUESE LANGUAGE AND LITERATURE

BIOLOGICAL SCIENCES

* BIOCHEMISTRY
BOTANY (INCLUDING PLANT PHYSIOLOGY, PLANT PATHOLOGY, MYCOLOGY)
* CELLULAR BIOLOGY/MOLECULAR BIOLOGY
* MICROBIOLOGY (INCLUDING IMMUNOLOGY, BACTERIOLOGY, PARASITOLOGY, VIROLOGY)
* PHYSIOLOGY (ANIMAL, HUMAN)
ZOOLOGY

ENGINEERING

* CHEMICAL ENGINEERING
* CIVIL ENGINEERING
* ELECTRICAL ENGINEERING
* MECHANICAL ENGINEERING

PHYSICAL SCIENCES

* CHEMISTRY
* COMPUTER SCIENCES
* GEOSCIENCES (INCLUDING GEOLOGY, GEOCHEMISTRY, GEOPHYSICS, GENL EARTH SCI)
* MATHEMATICS
* PHYSICS (EXCLUDING ASTRONOMY, ASTROPHYSICS)
STATISTICS (INCLUDING BIOSTATISTICS)

SOCIAL AND BEHAVIORAL SCIENCES

* ANTHROPOLOGY
* ECONOMICS
* HISTORY
* POLITICAL SCIENCE
* PSYCHOLOGY
* SOCIOLOGY

* DESIGNATES FIELDS FOR WHICH YOU ARE REQUESTED TO PROVIDE INFORMATION ON RESEARCH-DOCTORATE PROGRAMS IN YOUR INSTITUTION. (SEE INSTRUCTION SHEET REGARDING NOMINATION OF ADDITIONAL PROGRAMS TO BE INCLUDED IN THE STUDY) .

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**************************************************
***                                 - PART A   ***
**************************************************
```

PLEASE ANSWER EACH OF THE FOLLOWING QUESTIONS ABOUT THE RESEARCH-DOCTORATE PROGRAM

IN ______________________________

(1) WHAT IS THE NAME OF THE DEPARTMENT (OR EQUIVALENT ACADEMIC UNIT) IN WHICH THIS RESEARCH-DOCTORATE PROGRAM IS OFFERED ?

....

(2) HOW MANY PH.D.'S (OR EQUIVALENT RESEARCH-DOCTORATES) HAVE BEEN AWARDED IN THE PROGRAM IN EACH OF THE LAST FIVE ACADEMIC YEARS ?

1975-76 ....

1976-77 ....

1977-78 ....

1978-79 ....

1979-80 ....

(3) APPROXIMATELY HOW MANY FULL-TIME AND PART-TIME GRADUATE STUDENTS ENROLLED IN THE PROGRAM AT THE PRESENT TIME (FALL 1980) INTEND TO EARN DOCTORATES ?

FULL-TIME STUDENTS ....

PART-TIME STUDENTS ....

TOTAL ....

(4) IN APPROXIMATELY WHAT YEAR WAS THIS RESEARCH-DOCTORATE PROGRAM INITIATED ? (IF PROGRAM WAS DISCONTINUED AND SUBSEQUENTLY REINSTATED, PLEASE GIVE YEAR IT WAS REINSTATED) .

....

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*************************************************
***  _                          - PART B      ***
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(1) LIST BELOW ALL FACULTY WHO PARTICIPATE SIGNIFICANTLY IN DOCTORAL EDUCATION IN THIS PROGRAM (SEE INSTRUCTIONS SHEET). PLEASE PRINT OR TYPE NAMES IN FOLLOWING FORMAT: EXAMPLE: MARY A. JONES A. B. SMITH, JR.	(2) INDICATE THE ACADEMIC RANK OF EACH FACULTY MEMBER (PROF., ASSOC. PROF., ASST. PROF., ETC.).	(3) CHECK BELOW AT LEAST 2 FACULTY IN EACH RANK AVAILABLE AND WELL-QUALIFIED TO EVALUATE OTHER PROGRAMS (SEE INSTRUCTIONS SHEET).	(4) CHECK BELOW ANY FACULTY WHO DO NOT HOLD A PH.D. OR OTHER RESEARCH-DOCTORATE FROM A UNIVERSITY IN THE U.S. (SEE INSTRUCTIONS SHEET).
01	..	( )	( )
02	..	( )	( )
03	..	( )	( )
04	..	( )	( )
05	..	( )	( )
06	..	( )	( )
07	..	( )	( )
08	..	( )	( )
09	..	( )	( )
10	..	( )	( )
11	..	( )	( )
12	..	( )	( )
13	..	( )	( )
14	..	( )	( )
15	..	( )	( )
16	..	( )	( )
17	..	( )	( )
18	..	( )	( )
19	..	( )	( )
20	..	( )	( )

(PART B CONTINUED ON NEXT PAGE)

APPENDIX B

SURVEY OF EARNED DOCTORATES

(Conducted by the National Research Council under the sponsorship of the National Science Foundation, the Department of Education, the National Institutes of Health, and the National Endowment for the Humanities.)

This annual survey of new recipients of Ph.D. or equivalent research doctorates in all fields of learning contains information describing their demographic characteristics, educational background, graduate training, and postgraduation plans. The source file includes nearly complete data from all 1958-81 doctorate recipients and partial information for all 1920-57 doctoral graduates.

NSF Form 558 1977
OMB No. 99-R0290
Approval Expires June 30, 1979

SURVEY OF EARNED DOCTORATES

This form is to be returned to the GRADUATE DEAN, for forwarding to .... Board on Human-Resource Data and Analyses
Commission on Human Resources
National Research Council
2101 Constitution Avenue, Washington, D. C. 20418

Please print or type.

A. **Name in full:** .... (9-30)
(Last Name) (First Name) (Middle Name)

Cross Reference: Maiden name or former name legally changed .... (31)

B. **Permanent address through which you could always be reached:** (Care of, if applicable) ....

....
(Number) (Street) (City)

....
(State) (Zip Code) (Or Country if not U.S.)

C. **U.S. Social Security Number:** _ _ _ - _ _ - _ _ _ _ (32-40)

D. **Date of birth:** .... **Place of birth:** ....
(41-45) (Month) (Day) (Year) (46-47) (State) (Or Country if not U.S.)

E. **Sex:** 1 ☐ Male 2 ☐ Female (48)

F. **Marital status:** 1 ☐ Married 2 ☐ Not married (including widowed, divorced) (49)

G. **Citizenship:** 0 ☐ U.S. native 2 ☐ Non U.S., Immigrant (Permanent Resident)
1 ☐ U.S. naturalized 3 ☐ Non-U.S., Non-Immigrant (Temporary Resident) (50)
If Non-U.S., indicate country of present citizenship .... (51-52)

H. **Racial or ethnic group:** (Check all that apply.) *A person having origins in —*

0 ☐ American Indian or Alaskan Native	any of the original peoples of North America, and who maintain cultural identification through tribal affiliation or community recognition.
1 ☐ Asian or Pacific Islander	any of the original peoples of the Far East, Southeast Asia, the Indian Subcontinent, or the Pacific Islands. This area includes, for example, China, Japan, Korea, the Philippine Islands, and Samoa.
2 ☐ Black, not of Hispanic Origin	any of the black racial groups of Africa.
3 ☐ White, not of Hispanic Origin	any of the original peoples of Europe, North Africa, or the Middle East.
4 ☐ Hispanic	Mexican, Puerto Rican, Central or South American, or other Spanish culture or origins, regardless of race. (53-55)

I. **Number of dependents:** Do not include yourself. (Dependent = someone receiving at least one half of his or her support from you) ....(56)

J. **U.S. veteran status:** 0 ☐ Veteran 1 ☐ On active duty 2 ☐ Non-veteran or not applicable (57)

[illegible]

K. **High school last attended:** .... (58-59)
(School Name) (City) (State)

Year of graduation from high school: .... (60-61)

L. **List in the table below all collegiate and graduate institutions you have attended including 2-year colleges. List chronologically, and include your doctoral institution as the last entry.**

Institution Name	Location	Years Attended		Major Field		Minor Field	Degree (if any)		
				Use Specialties List				Granted	
		From	To	Name	Number	Number	Title of Degree	Mo.	Yr.

M. **Enter below the title of your doctoral dissertation and the most appropriate classification number and field. If a project report or a musical or literary composition (not a dissertation) is a degree requirement, please check box.** ☐ (44)

Title ....

....

....

Classify using Specialties List
Number .... Name of field ....

N. **Name the department (or interdisciplinary committee, center, institute, etc.) and school or college of the university which supervised your doctoral program:** ....
(Department/Institute/Committee/Program) (School)

O. **Name of your dissertation adviser:** ....
(Last Name) (First Name) (Middle Initial)

continued on next page

SURVEY OF EARNED DOCTORATES, Cont.

P. Please enter a "1" beside your primary source of support during graduate study. Enter a "2" beside your secondary source of support during graduate study. Check all other sources from which support was received.

58 ___ NSF Fellowship
59 ___ NSF Traineeship
60 ___ NIH Fellowship
61 ___ NIH Traineeship
62 ___ NDEA Fellowship
63 ___ Other HEW
64 ___ AEC/ERDA Fellowship
65 ___ NASA Traineeship
66 ___ GI Bill
67 ___ Other Federal support (specify) ....
68 ___ Woodrow Wilson Fellowship
69 ___ Other U.S. national fellowship (specify) ....
70 ___ University Fellowship
71 ___ Teaching Assistantship
72 ___ Research Assistantship
73 ___ Educational fund of industrial or business firm
74 ___ Other institutional funds (specify) ....
75 ___ Own earnings
76 ___ Spouse's earnings
77 ___ Family contributions
78 ___ Loans (NDSL direct)
79 ___ Other loans
80 ___ Other (specify) ....

Q. Please check the space which most fully describes your status during the year immediately preceding the doctorate.

0 ☐ Held fellowship
1 ☐ Held assistantship
2 ☐ Held own research grant
3 ☐ Not employed
4 ☐ Part-time employed

Full-time Employed in: (Other than 0, 1, 2)
5 ☐ College or university, teaching
6 ☐ College or university, non-teaching
7 ☐ Elem. or sec. school, teaching
8 ☐ Elem. or sec. school, non-teaching
9 ☐ Industry or business
(11) ☐ Other (specify) ....

(12) ☐ Any other (specify) .... (9)

R. How many years (full-time equivalent basis) of professional work experience did you have prior to the doctorate? (include assistantships as professional experience) .... (10-11)

POSTGRADUATION PLANS

S. How well defined are your postgraduation plans?
0 ☐ Have signed contract or made definite commitment
1 ☐ Am negotiating with a specific organization, or more than one
2 ☐ Am seeking appointment but have no specific prospects

3 ☐ Other (specify) .... (12)

T. What are your immediate postgraduation plans?
0 ☐ Postdoctoral fellowship?
1 ☐ Postdoctoral research associateship?
2 ☐ Traineeship?
3 ☐ Other study (specify) ....
} Go to Item "U"
4 ☐ Employment (other than 0, 1, 2, 3)
5 ☐ Military service?
6 ☐ Other (specify).................... (13)
} Go to Item "V"

U. If you plan to be on a postdoctoral fellowship, associateship, traineeship or other study

What will be the field of your postdoctoral study?
Classify using Specialties List.
Number .... Field .... (14-16)

What will be the primary source of support?
0 ☐ U.S. Government
1 ☐ College or university
2 ☐ Private foundation
3 ☐ Nonprofit, other than private foundation
4 ☐ Other (specify) .... (17)
6 ☐ Unknown

Go to Item "W"

V. If you plan to be employed, enter military service, or other — What will be the type of employer?
0 ☐ 4-year college or university other than medical school
1 ☐ Medical school
2 ☐ Jr. or community college
3 ☐ Elem. or sec. school
4 ☐ Foreign government
5 ☐ U.S. Federal government
6 ☐ U.S. state government
7 ☐ U.S. local government
8 ☐ Nonprofit organization
9 ☐ Industry or business
(11) ☐ Self-employed
(12) ☐ Other (specify) .... (18)

Indicate *primary* work activity with "1" in appropriate box; *secondary* work activity (if any) with "2" in appropriate box.
0 ☐ Research and development
1 ☐ Teaching
2 ☐ Administration
3 ☐ Professional services to individuals
5 ☐ Other (specify).................... (19-20)

In what field will you be working?
Please enter number from Specialties List .... (21-23)

Go to Item "W"

W. What is the name and address of the organization with which you will be associated?

.... (Name of Organization)

.... (Street) .... (City, State) (Or Country if not U.S.) (24-29)

BACKGROUND INFORMATION

X. Please indicate, by circling the highest grade attained, the education of

your father:	none	1 2 3 4 5 6 7 8	9 10 11 12	1 2 3 4	MA, MD PhD	Postdoctoral	(30)
		Elementary school	High school	College	Graduate		
your mother	none	1 2 3 4 5 6 7 8	9 10 11 12	1 2 3 4	MA, MD PhD	Postdoctoral	(31)
	0	1 2 3	4 5	6 7	8 9	(11)	

Signature .... Date completed .... (32-34)

BEST AVAILABLE COPY

APPENDIX C

LETTER TO EVALUATORS

COMMITTEE ON AN ASSESSMENT OF QUALITY-RELATED CHARACTERISTICS
OF RESEARCH-DOCTORATE PROGRAMS IN THE UNITED STATES

Established by the Conference Board of Associated Research Councils

Office of the Staff Director / National Research Council / 2101 Constitution Avenue, N.W. / Washington, D.C. 20418

April 14, 1981

Dear

As you may already know, our committee has undertaken an assessment of research-doctorate programs in U.S. universities. The study is examining approximately 2,650 programs in 31 fields in the arts and humanities, biological sciences, engineering, physical and mathematical sciences, and social sciences. A study prospectus is provided on the reverse of this page. You have been selected from a faculty list furnished by your institution to evaluate programs offering research-doctorates in the field of English Language and Literature.

On the first page of the attached form is a list of the 145 programs that are being evaluated in this field. These programs produce more than 90 percent of the doctorate recipients in the field. In order to keep the task manageable, you are being asked to consider a randomly selected subset of 50 of these programs. These are designated with an asterisk in the list on the next page and are presented in random sequence on the evaluation sheets that follow. Please read the accompanying instructions carefully before attempting your evaluations.

We ask that you complete the attached survey form and return it in the enclosed envelope within the next three weeks. The evaluations you and your colleagues render will constitute an important component of this study. Your prompt attention to this request will be very much appreciated by our committee.

Sincerely,

Gardner Lindzey

Lyle Jones
For the Study Committee

Enclosures

COMMITTEE MEMBERS

Lyle V. Jones, Co-Chairman
Gardner Lindzey, Co-Chairman
Paul A. Albrecht
Marcus Alexis
Robert M. Bock
Philip E. Converse
James H. M. Henderson
Ernest S. Kuh
Winfred P. Lehmann
Saunders Mac Lane
Nancy S. Milburn
Lincoln E. Moses
James C. Olson
Kumar Patel
Michael J. Pelczar, Jr.
Jerome B. Schneewind
Duane C. Spriestersbach
Harriet A. Zuckerman

RESEARCH-DOCTORATE PROGRAMS IN THE FIELD OF ENGLISH LANGUAGE AND LITERATURE
(* DESIGNATES THE PROGRAMS WHICH YOU ARE ASKED TO EVALUATE ON THE FOLLOWING PAGES.)

INSTITUTION - DEPARTMENT/ACADEMIC UNIT

* AMERICAN UNIVERSITY - LITERATURE
* ARIZONA STATE UNIVERSITY, TEMPE - ENGLISH
* UNIVERSITY OF ARIZONA, TUCSON - ENGLISH
* UNIVERSITY OF ARKANSAS, FAYETTEVILLE - ENGLISH
AUBURN UNIVERSITY - ENGLISH
BALL STATE UNIVERSITY - ENGLISH
* BOSTON COLLEGE - ENGLISH
BOSTON UNIVERSITY - ENGLISH
* BOWLING GREEN STATE UNIVERSITY - ENGLISH
BRANDEIS UNIVERSITY - ENGLISH AND AMERICAN LITERATURE
BROWN UNIVERSITY - ENGLISH
* BRYN MAWR COLLEGE - ENGLISH
* UNIVERSITY OF CALIFORNIA, BERKELEY - ENGLISH
UNIVERSITY OF CALIFORNIA, DAVIS - ENGLISH
UNIVERSITY OF CALIFORNIA, IRVINE - ENGLISH
UNIVERSITY OF CALIFORNIA, LOS ANGELES - ENGLISH
UNIVERSITY OF CALIFORNIA, RIVERSIDE - ENGLISH
UNIVERSITY OF CALIFORNIA, SAN DIEGO - LITERATURE
UNIVERSITY OF CALIFORNIA, SANTA BARBARA - ENGLISH
* CASE WESTERN RESERVE UNIVERSITY - ENGLISH
CATHOLIC UNIVERSITY OF AMERICA - ENGLISH
UNIVERSITY OF CHICAGO - HUMANITIES
* CUNY, THE GRADUATE SCHOOL - ENGLISH
CLAREMONT GRADUATE SCHOOL - ENGLISH
UNIVERSITY OF COLORADO, BOULDER - ENGLISH
* COLUMBIA UNIV-GRAD SCHOOL OF ARTS & SCI - ENGLISH AND COMPARATIVE LITERATURE
UNIVERSITY OF CONNECTICUT, STORRS - ENGLISH
CORNELL UNIVERSITY, ITHACA - ENGLISH LANGUAGE AND LITERATURE
UNIVERSITY OF DELAWARE, NEWARK - ENGLISH
* UNIVERSITY OF DENVER - ENGLISH
DUKE UNIVERSITY - ENGLISH
* EMORY UNIVERSITY - ENGLISH
FORDHAM UNIVERSITY - ENGLISH LANGUAGE AND LITERATURE
GEORGIA STATE UNIVERSITY, ATLANTA - ENGLISH
UNIVERSITY OF GEORGIA, ATHENS - ENGLISH
* HARVARD UNIVERSITY - ENGLISH AND AMERICAN LITERATURE AND LANGUAGE
* UNIV OF ILLINOIS AT URBANA-CHAMPAIGN - ENGLISH
INDIANA UNIVERSITY, BLOOMINGTON - ENGLISH
* UNIVERSITY OF IOWA, IOWA CITY - ENGLISH
* JOHNS HOPKINS UNIVERSITY - ENGLISH
KANSAS STATE UNIVERSITY, MANHATTAN - ENGLISH
UNIVERSITY OF KANSAS - ENGLISH
KENT STATE UNIVERSITY - ENGLISH
UNIVERSITY OF KENTUCKY - ENGLISH
* LEHIGH UNIVERSITY - ENGLISH
LOUISIANA STATE UNIVERSITY, BATON ROUGE - ENGLISH
* LOYOLA UNIVERSITY OF CHICAGO - ENGLISH
MARQUETTE UNIVERSITY - ENGLISH
UNIVERSITY OF MARYLAND, COLLEGE PARK - ENGLISH LANGUAGE AND LITERATURE
UNIVERSITY OF MASSACHUSETTS, AMHERST - ENGLISH
MICHIGAN STATE UNIVERSITY, EAST LANSING - ENGLISH
UNIVERSITY OF MICHIGAN, ANN ARBOR - ENGLISH LANGUAGE AND LITERATURE
UNIVERSITY OF MINNESOTA - ENGLISH
* UNIVERSITY OF MISSISSIPPI, OXFORD - ENGLISH
UNIVERSITY OF MISSOURI, COLUMBIA - ENGLISH
* UNIVERSITY OF NEBRASKA, LINCOLN - ENGLISH
UNIVERSITY OF NEW MEXICO, ALBUQUERQUE - ENGLISH
* NEW YORK UNIVERSITY - ENGLISH
* UNIVERSITY OF NORTH CAROLINA, CHAPEL HILL - ENGLISH
UNIVERSITY OF NORTH DAKOTA, GRAND FORKS - ENGLISH
* NORTHERN ILLINOIS UNIVERSITY, DE KALB - ENGLISH
NORTHWESTERN UNIVERSITY - ENGLISH
UNIVERSITY OF NOTRE DAME - ENGLISH
* OHIO STATE UNIVERSITY - ENGLISH
* OHIO UNIVERSITY - ENGLISH LANGUAGE AND LITERATURE
* OKLAHOMA STATE UNIVERSITY, STILLWATER - ENGLISH
* UNIVERSITY OF OKLAHOMA - ENGLISH
UNIVERSITY OF OREGON, EUGENE - ENGLISH LANGUAGE AND LITERATURE
* PENNSYLVANIA STATE UNIVERSITY - ENGLISH
UNIVERSITY OF PENNSYLVANIA - ENGLISH
UNIVERSITY OF PITTSBURGH - ENGLISH
* PRINCETON UNIVERSITY - ENGLISH
* PURDUE UNIVERSITY, WEST LAFAYETTE - ENGLISH

(CONTINUED ON REVERSE)

UNIVERSITY OF RHODE ISLAND - ENGLISH
RICE UNIVERSITY - ENGLISH
UNIVERSITY OF ROCHESTER - ENGLISH
RUTGERS UNIVERSITY, NEW BRUNSWICK - ENGLISH
* SAINT LOUIS UNIVERSITY - ENGLISH
* UNIVERSITY OF SOUTH CAROLINA, COLUMBIA - ENGLISH
* UNIVERSITY OF SOUTHERN CALIFORNIA - ENGLISH
* SOUTHERN ILLINOIS UNIVERSITY, CARBONDALE - ENGLISH
STANFORD UNIVERSITY - ENGLISH
* UNIVERSITY OF FLORIDA, GAINESVILLE - ENGLISH
FLORIDA STATE UNIVERSITY, TALLAHASSEE - ENGLISH
* SUNY AT BINGHAMTON - ENGLISH, GENERAL LITERATURE, AND RHETORIC
SUNY AT BUFFALO - ENGLISH
* SUNY AT STONY BROOK - ENGLISH
* SYRACUSE UNIVERSITY - ENGLISH
TEMPLE UNIVERSITY - ENGLISH
UNIVERSITY OF TENNESSEE, KNOXVILLE - ENGLISH
* TEXAS A&M UNIVERSITY - ENGLISH
* TEXAS TECH UNIVERSITY, LUBBOCK - ENGLISH
* UNIVERSITY OF TEXAS, AUSTIN - ENGLISH
TUFTS UNIVERSITY - ENGLISH
* TULANE UNIVERSITY - ENGLISH
UNIVERSITY OF TULSA - MODERN LETTERS
* UNIVERSITY OF UTAH, SALT LAKE CITY - ENGLISH
* VANDERBILT UNIVERSITY - ENGLISH
UNIVERSITY OF VIRGINIA - ENGLISH
* WASHINGTON STATE UNIVERSITY, PULLMAN - ENGLISH
* WASHINGTON UNIVERSITY (ST LOUIS) - ENGLISH AND AMERICAN LITERATURE
* UNIVERSITY OF WASHINGTON, SEATTLE - ENGLISH
* WAYNE STATE UNIVERSITY - ENGLISH
UNIVERSITY OF WISCONSIN, MADISON - ENGLISH
UNIVERSITY OF WISCONSIN, MILWAUKEE - ENGLISH
* YALE UNIVERSITY - ENGLISH LANGUAGE AND LITERATURE

INSTRUCTIONS

At the top of the next page please provide the information requested on the highest degree you hold and your current field of specialization. You may be assured that all information you furnish on the survey form is to be used for purposes of statistical description only and that the confidentiality of your responses will be protected.

On the pages that follow you are asked to judge 50 programs (presented in random sequence) that offer the research-doctorate. Each program is to be evaluated in terms of: (1) scholarly quality of program faculty; (2) effectiveness of program in educating research scholars/scientists; and (3) change in program quality in the last five years (see below). Although the assessment is limited to these factors, our committee recognizes that other factors are relevant to the quality of doctoral programs, and that graduate programs serve important purposes in addition to that of educating doctoral candidates.

A list of the faculty members signficantly involved in each program, the name of the academic unit in which the program is offered, and the number of doctorates awarded in that program during the last five years have been printed on the survey form (whenever available). Although this information has been furnished to us by the institution and is believed to be accurate, it has not been verified by our study committee and may have a few omissions, misspellings, or other errors.

Before marking your responses on the survey form, you may find it helpful to look over the full set of programs you are being asked to evaluate. In making your judgments about each program, please keep in mind the following instructions:

(1) Scholarly Quality of Program Faculty. Check the box next to the term that most closely corresponds to your judgment of the quality of faculty in the research-doctorate program described. Consider only the scholarly competence and achievements of the faculty. It is suggested that no more than five programs be designated "distinguished."

(2) Effectiveness of Program in Educating Research Scholars/Scientists. Check the box next to the term that most closely corresponds to your judgment of the doctoral program's effectiveness in educating research scholars/scientists. Consider the accessibility of the faculty, the curricula, the instructional and research facilities, the quality of graduate students, the performance of the graduates, and other factors that contribute to the effectiveness of the research-doctorate program.

(3) Change in Program Quality in Last Five Years. Check the box next to the term that most closely corresponds to your estimate of the change that has taken place in the research-doctorate program in the last five years. Consider both the scholarly quality of the program faculty and the effectiveness of the program in educating research scholars/scientists. Compare the quality of the program today with its quality five years ago--not the change in the program's relative standing among other programs in the field.

In assessing each of these factors, mark the category "Don't know well enough to evaluate" if you are unfamiliar with that aspect of the program. It is quite possible that for some programs you may be knowledgeable about the scholarly quality of the faculty, but not about the effectiveness of the program or change in program quality.

For each of the programs identified, you are also asked to indicate the extent to which you are familiar with the work of members of the program faculty. For example, if you recognize only a very small fraction of the faculty, you should mark the category "Little or no familiarity."

Please be certain that you have provided a set of responses for each of the programs identified on the following pages. The fully completed survey form should be returned in the enclosed envelope to:

Committee on an Assessment of Quality-Related
Characteristics of Research-Doctorate Programs
National Research Council, JH-638
2101 Constitution Avenue, N.W.
Washington, D.C. 20418

Our committee will be most appreciative of your thoughtful assessment of these research-doctorate programs. We welcome any comments you may wish to append to the completed survey form.

PLEASE PROVIDE THE FOLLOWING INFORMATION: **FORM NO. 2116-57**

HIGHEST DEGREE YOU HOLD: ( ) PH.D. ( ) OTHER (PLEASE SPECIFY): ______________________

YEAR OF HIGHEST DEGREE: ________

INSTITUTION OF HIGHEST DEGREE: ____________________________

YOUR CURRENT FIELD OF SPECIALIZATION (CHECK ONLY ONE):

A. ( ) ENGLISH LANGUAGE AND LITERATURE

B. ( ) OTHER (PLEASE SPECIFY):

____

INSTITUTION: **HARVARD UNIVERSITY** **FORM NO. 2116-01**
DEPARTMENT/ACADEMIC UNIT: ENGLISH AND AMERICAN LITERATURE AND LANGUAGE
TOTAL DOCTORATES AWARDED 1976-80: 34

PROFESSORS: Daniel AARON, William ALFRED, Herschel BAKER, W. J. BATE, Larry D. BENSON, Warner BERTHOFF, Morton W. BLOOMFIELD, William H. BOND, Robert BRUSTEIN, Jerome H. BUCKLEY, John M. BULLITT, Stanley CAVELL, Robert H. CHAPMAN, Charles W. DUNN, Monroe ENGEL, G. Blakemore EVANS, Robert S. FITZGERALD, Alan HEIMERT, Walter J. KAISER, John V. KELLEHER, Robert J. KIELY, Harry LEVIN, David PERKINS, Joel PORTE

ASSOCIATE PROFESSORS: James T. ENGELL

ASSISTANT PROFESSORS: Ronald BUSH, John KLAUSE, Heather MCCLAVE, Elizabeth R. MCKINSEY, James MILLER, Albert J. VONFRANK, Robert N. WATSON

OTHER STAFF: Richard C. MARIUS

SCHOLARLY QUALITY OF PROGRAM FACULTY

1. ( ) *DISTINGUISHED*
2. ( ) *STRONG*
3. ( ) *GOOD*
4. ( ) *ADEQUATE*
5. ( ) *MARGINAL*
6. ( ) *NOT SUFFICIENT FOR DOCTORAL EDUCATION*

0. ( ) *DON'T KNOW WELL ENOUGH TO EVALUATE*

FAMILIARITY WITH WORK OF PROGRAM FACULTY

1. ( ) *CONSIDERABLE FAMILIARITY*
2. ( ) *SOME FAMILIARITY*
3. ( ) *LITTLE OR NO FAMILIARITY*

EFFECTIVENESS OF PROGRAM IN EDUCATING RESEARCH SCHOLARS/SCIENTISTS

1. ( ) *EXTREMELY EFFECTIVE*
2. ( ) *REASONABLY EFFECTIVE*
3. ( ) *MINIMALLY EFFECTIVE*
4. ( ) *NOT EFFECTIVE*

0. ( ) *DON'T KNOW WELL ENOUGH TO EVALUATE*

CHANGE IN PROGRAM QUALITY IN LAST FIVE YEARS

1. ( ) *BETTER THAN FIVE YEARS AGO*
2. ( ) *LITTLE OR NO CHANGE IN LAST FIVE YEAR*
3. ( ) *POORER THAN FIVE YEARS AGO*

0. ( ) *DON'T KNOW WELL ENOUGH TO EVALUATE*

INSTITUTION: SUNY AT STONY BROOK — FORM NO. 2116-02
DEPARTMENT/ACADEMIC UNIT: ENGLISH
TOTAL DOCTORATES AWARDED 1976-80: 69

PROFESSORS: Thomas J. J. ALTIZER, David V. ERDMAN, Thomas FLANAGAN, Donald FRY, Homer GOLDBERG, Harvey GROSS, Jan KOTT, Thomas KRANIDAS, Richard LEVIN, Richard LEVINE, Jack LUDWIG, Thomas MARESCA, Ruth MILLER, Louis SIMPSON, Judah STAMPFER, John THOMPSON, Herbert WEISINGER

ASSOCIATE PROFESSORS: Paul DOLAN, Edward FEISS, Clifford HUFFMAN, Aaron LIPTON, Joseph PEQUIGNEY, Thomas ROGERS, Walter SCHEPS, Sallie SEARS, Peter SHAW, Alice WILSON, Rose ZIMBARDO

ASSISTANT PROFESSORS: Bruce BASHFORD, Diane FORTUNA, William HARRIS, David LAURENCE, Paul NEWLIN, David SHEEHAN, Setphen SPECTOR, Susan SQUIER

SCHOLARLY QUALITY OF PROGRAM FACULTY

1. ( ) DISTINGUISHED
2. ( ) STRONG
3. ( ) GOOD
4. ( ) ADEQUATE
5. ( ) MARGINAL
6. ( ) NOT SUFFICIENT FOR DOCTORAL EDUCATION

0. ( ) DON'T KNOW WELL ENOUGH TO EVALUATE

FAMILIARITY WITH WORK OF PROGRAM FACULTY

1. ( ) CONSIDERABLE FAMILIARITY
2. ( ) SOME FAMILIARITY
3. ( ) LITTLE OR NO FAMILIARITY

EFFECTIVENESS OF PROGRAM IN EDUCATING RESEARCH SCHOLARS/SCIENTISTS

1. ( ) EXTREMELY EFFECTIVE
2. ( ) REASONABLY EFFECTIVE
3. ( ) MINIMALLY EFFECTIVE
4. ( ) NOT EFFECTIVE

0. ( ) DON'T KNOW WELL ENOUGH TO EVALUATE

CHANGE IN PROGRAM QUALITY IN LAST FIVE YEARS

1. ( ) BETTER THAN FIVE YEARS AGO
2. ( ) LITTLE OR NO CHANGE IN LAST FIVE YEAR
3. ( ) POORER THAN FIVE YEARS AGO

0. ( ) DON'T KNOW WELL ENOUGH TO EVALUATE

INSTITUTION: PRINCETON UNIVERSITY — FORM NO. 2116-03
DEPARTMENT/ACADEMIC UNIT: ENGLISH
TOTAL DOCTORATES AWARDED 1976-80: 50

PROFESSORS: Hans C. AARSLEFF, Lawrence N. DANSON, Margatet A. DOODY, John V. FLEMING, Michael P. GOLDMAN, Samuel HYNES, Edmund KEELEY, Alvin B. KERNAN, Ulrich C. KNOEPFLMACHER, A. Walton LITZ Jr, Richard M. LUDWIG, Thomas MCFARLAND, Henry K. MILLER, Earl MINER, Thomas P. ROCHE Jr, Theodore R. WEISS

ASSOCIATE PROFESSORS: Maria A. DIBATTISTA, Emory ELLIOTT, William L. HOWARTH

ASSISTANT PROFESSORS: James H. AVERILL, David BROMWICH, Andrew FICHTER, Gail GIBSON, Dorothy KLOPF Lee C. MITCHELL, Carol ROSEN, Harry J. SOLO

SCHOLARLY QUALITY OF PROGRAM FACULTY

1. ( ) DISTINGUISHED
2. ( ) STRONG
3. ( ) GOOD
4. ( ) ADEQUATE
5. ( ) MARGINAL
6. ( ) NOT SUFFICIENT FOR DOCTORAL EDUCATION

0. ( ) DON'T KNOW WELL ENOUGH TO EVALUATE

FAMILIARITY WITH WORK OF PROGRAM FACULTY

1. ( ) CONSIDERABLE FAMILIARITY
2. ( ) SOME FAMILIARITY
3. ( ) LITTLE OR NO FAMILIARITY

EFFECTIVENESS OF PROGRAM IN EDUCATING RESEARCH SCHOLARS/SCIENTISTS

1. ( ) EXTREMELY EFFECTIVE
2. ( ) REASONABLY EFFECTIVE
3. ( ) MINIMALLY EFFECTIVE
4. ( ) NOT EFFECTIVE

0. ( ) DON'T KNOW WELL ENOUGH TO EVALUATE

CHANGE IN PROGRAM QUALITY IN LAST FIVE YEARS

1. ( ) BETTER THAN FIVE YEARS AGO
2. ( ) LITTLE OR NO CHANGE IN LAST FIVE YEAR
3. ( ) POORER THAN FIVE YEARS AGO

0. ( ) DON'T KNOW WELL ENOUGH TO EVALUATE

APPENDIX D

THE ARL LIBRARY INDEX

(SOURCE: Mandel, Carol A., and Mary P. Johnson, ARL Statistics 1979-80, Association of Research Libraries, Washington, D.C., 1980, pp. 23-24.)

The data tables at the beginning of the ARL Statistics display figures reported by ARL member libraries in 22 categories that, with the exception of the measures of interlibrary loan activity, describe the size of ARL libraries in terms of holdings, expenditures, and personnel. The rank order tables provide an overview of the ranges and medians for 14 of these categories, or variables, among ARL academic libraries as well as quantitatively comparing each library with other ARL member institutions. However, none of the 22 variables provides a summary measure of a library's relative size within ARL or characterizes the ARL libraries as a whole.

The ARL Library Index has been derived as a means of providing this summary characterization, permitting quantitative comparisons of ARL academic libraries, singly and as a group, with other academic libraries. Through the use of statistical techniques known as factor analysis, it can be determined that 15 of the variables reported to ARL are more closely correlated with each other than with other categories. Within this group of 15 variables, some are subsets or combinations of materials. When the subsets and combinations are eliminated, 10 variables emerge as characteristic of ARL libary size. These are: volumes held, volumes added (gross), microform units held, current serials received, expenditures for library materials, expenditures for binding, total salary and wage expenditures, other operating expenditures, number of professional staff, and number of nonprofessional staff.

These 10 categories delineate an underlying dimension, or factor, of library size. By means of principal component analysis, a technique that is a variant of factor analysis, it is possible to calculate the correlations of each of the variables with this hypothetical factor of library size. From this analysis a weight for each variable can be determined based on how closely that variable is correlated with the overall dimension of library size defined by all 10 categories. A high correlation indicates that much of the variation in ARL library size is accounted for by the variable in question, implying a characteristic in which ARL libraries are relatively alike. The component score coefficients, or weights, for

the 1979-80 ARL academic library data are as follows:

Volumes held	.12108
Volumes added (gross)	.11940
Microforms held	.07509
Current serials received	.12253
Expenditures for library materials	.12553
Expenditures for binding	.11266
Expenditures for salaries and wages	.12581
Other operating expenditures	.10592
Number of professional staff	.12347
Number of nonprofessional staff	.11297

From these weights an individual library can compute an index score that will indicate its relative position among ARL libraries with respect to the overall factor of library size. The data for each of the 10 variables are converted to standard normal form and multiplied by the appropriate weight. The resulting scores are expressed in terms of the number of standard deviations above or below the mean index score for ARL academic libraries. Thus, the formula* for calculating a library's 1979-80 index score is as follows:

.12108 (log of volumes held - 6.2916)/.2172
+.11940 (log of volumes added gross - 4.8412)/.2025
+.07509 (log of microforms - 6.0950)/.1763
+.12253 (log of current serials - 4.3432)/.2341
+.12553 (log of expenditures for materials - 6.2333)/.1636
+.11266 (log of expenditures for binding - 5.0480)/.2475
+.12581 (log of total salaries - 6.4675)/.2103
+.10592 (log of operating expenditures - 5.6773)/.2635
+.12347 (log of professional staff - 1.8281)/.1968
+.11297 (log of nonprofessional staff - 2.1512)/.2046

The index scores for the 99 academic libraries that were members of ARL during 1979-80 are shown on the following page. It is important to emphasize that these scores are only a summary description of library size, distributing ARL libraries along a normal curve, based on 10 quantitative measures that are positively correlated with one another in ARL libraries. The scores are in no way a qualitative assessment of the collections, services, or operations of these libraries.

---

*For calculation on a hand calculator, the formula can be mathematically simplified to: (.55746 x log of volumes held) + (.58963 x log of volumes added gross) + (.42592 x log of microforms) + (.52341 x log of current serials) + (.76730 x log of expenditures for materials) + (.45519 x log of expenditures for binding) + (.59824 x log of total salries) + (.40197 x log of operating expenditures) + (.62739 x log of professional staff) + (.55215 x log of nonprofessional staff) - 26.79765.

APPENDIX E

CONFERENCE ON THE ASSESSMENT OF QUALITY OF GRADUATE EDUCATION PROGRAMS

September 27-29, 1976
Woods Hole, Massachusetts

Participants

Robert A. ALBERTY	Dean of Science, Massachusetts Institute of Technology
Charles ANDERSEN	Coordinator, Education Statistics, American Council on Education
Richard C. ATKINSON	Acting Director, National Science Foundation
R. H. BING	Chairman, Department of Mathematics, University of Texas at Austin
David W. BRENEMAN	Senior Fellow, The Brookings Institution
John E. CANTLON	Vice-President for Research and Graduate Studies, Michigan State University
Henry E. COBB	Professor, Department of History, Southern University
Monroe D. DONSKER	Professor, Courant Institute of Mathematical Sciences, New York University
David E. DREW	Senior Scientist, Rand Corporation
E. Alden DUNHAM	Program Officer, Carnegie Corporation of New York
David A. GOSLIN	Executive Director, Assembly of Behavioral and Social Sciences, National Research Council
Hanna H. GRAY	Provost, Yale University
Norman HACKERMAN	President, Rice University
Philip HANDLER	President, National Academy of Sciences
David D. HENRY	President Emeritus, University of Illinois
Roger W. HEYNS	President, American Council on Education
Lyle V. JONES	Vice Chancellor and Dean, Graduate School, University of North Carolina at Chapel Hill
Charles V. KIDD	Executive Secretary, Association of American Universities
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Charles T. LESTER	Vice-President of Arts and Sciences, Emory University

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H. Edwin YOUNG	Chancellor, University of Wisconsin, Madison
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SUMMARY

September 27-29, 1976, Woods Hole, Massachusetts

Report of the Conference

A substantial majority of the Conference believes that the earlier assessments of graduate education have received wide and important use: by students and their advisors, by the institutions of higher education as aids to planning and the allocation of educational functions, as a check of unwarranted claims of excellence, and in social science research.

The recommendations which follow attempt to distill the main points of consensus within the conference. This report does not in any sense adequately represent the rich diversity of points of view revealed during the Conference nor the deep and real differences in belief among the participants.

Recommendations

1. A new assessment of graduate programs is needed, and we believe that the Conference Board is an appropriate sponsor. While we do not propose to specify the details of this assessment, we are prepared to suggest the following guidelines.

2. The assessment should include a modified replication of the Roose-Andersen study, with the addition of some fields and the subdivision of others.

3. It is important to provide additional indices relevant to program assessment such as some of those cited by Breneman, Drew, and Page. The Conference directs specific attention to the CGS/ETS Study currently nearing completion and urges that the results of that study be carefully examined and used to the fullest possible extent.

4. The initial assessment study should be one of surveying the quality of scholarship and research and the effectiveness of Ph.D. programs in the fields selected for inclusion.

    a. It is intended that the study be carried forward on a continuing basis to provide valuable longitudinal data. This should be implemented along the lines suggested by Moses, involving annual assessment of subsets of programs.

    b. Every eligible institution should be given the choice of whether to be included in the study.

    c. Each program is to be characterized by a set of scores, one for each selected index. The presentation of scores for all

reported indices should be accompanied by a discussion of their substantive meaning. In addition, appropriate measures of uncertainty should accompany all tables of results.

5. We propose a simultaneous study exploring ways of reviewing goals of graduate education other than research and scholarship. This would involve review of other doctoral programs and selected master's programs.

APPENDIX F

PLANNING COMMITTEE FOR THE STUDY OF THE QUALITY OF RESEARCH-DOCTORATE PROGRAMS

September 1978

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APPENDIX G

REGION AND STATE CODES
FOR THE UNITED STATES AND POSSESSIONS
(and U.S. Government)

REGION 1 - NEW ENGLAND

11	Maine
12	New Hampshire
13	Vermont
14	Massachusetts
15	Rhode Island
16	Connecticut

REGION 2 - MIDDLE ATLANTIC

21	New York
22	New Jersey
23	Pennsylvania

REGION 3 - EAST NORTH CENTRAL

31	Ohio
32	Indiana
33	Illinois
34	Michigan
35	Wisconsin

REGION 4 - WEST NORTH CENTRAL

41	Minnesota
42	Iowa
43	Missouri
44	North Dakota
45	South Dakota
46	Nebraska
47	Kansas

REGION 5 - SOUTH ATLANTIC

51	Delaware
52	Maryland
53	District of Columbia
54	Virginia
55	West Virginia
56	North Carolina
57	South Carolina
58	Georgia
59	Florida

REGION 6 - EAST SOUTH CENTRAL

61	Kentucky
62	Tennessee
63	Alabama
64	Mississippi

REGION 7 - WEST SOUTH CENTRAL

71	Arkansas
72	Louisiana
73	Oklahoma
74	Texas

REGION 8 - MOUNTAIN

81	Montana
82	Idaho
83	Wyoming
84	Colorado
85	New Mexico
86	Arizona
87	Utah
88	Nevada

REGION 9 - PACIFIC

90	Guam
91	Washington
92	Oregon
93	California
94	Alaska
95	Hawaii
96	Virgin Islands
97	Panama Canal Zone
98	Puerto Rico

R6000-14.3A

An Assessment of Research-Doctorate Programs in the United States:
Engineering

Committee on an Assessment of Quality-Related Characteristics of Research-Doctorate Programs in the United States

Lyle V. Jones, Gardner Lindzey, and
Porter E. Coggeshall, *Editors*

Sponsored by

The Conference Board of Associated Research Councils

American Council of Learned Societies
American Council on Education
National Research Council
Social Science Research Council

NATIONAL ACADEMY PRESS
Washington, D.C. 1982

NOTICE: The project that is the subject of this report was approved by the Conference Board of Associated Research Councils, whose members are drawn from the American Council of Learned Societies, the American Council on Education, the National Research Council, and the Social Science Research Council. The members of the committee responsible for the report were chosen for their special competences and with regard for appropriate balance.

This report has been reviewed by a group other than the authors and editors according to procedures approved by each of the four member Councils of the Conference Board.

The Conference Board of Associated Research Councils was created to foster discussion of issues of mutual interest; to determine the extent to which a common viewpoint on such issues prevails within the academic community of the United States; to foster specific investigations when so desired; and, when the Conference Board finds joint, common, or other action desirable, to make recommendations to the appropriate Councils.

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In conducting this assessment the committee has benefited from the support and advice of many individuals and organizations. The assessment was conducted under the aegis of the Conference Board of Associated Research Councils, and special thanks go to Roger Heyns, Robert M. Lumiansky, Jack W. Peltason, Frank Press, Kenneth Prewitt, Eleanor Sheldon, John William Ward, and the late Philip Handler for their efforts in overseeing the planning and execution of this project. Financial support was provided by the Andrew W. Mellon Foundation, the Ford Foundation, the Alfred P. Sloan Foundation, the National Institutes of Health (NIH), the National Science Foundation (NSF), and the National Academy of Sciences. Without the combined support from these organizations the project would not have been undertaken. The committee appreciates the excellent cooperation it received from the staff officers at these organizations--including John Sawyer and James Morris at Mellon; Mariam Chamberlain, Gladys Chang Hardy, and Sheila Biddle at Ford; Albert Rees and James Koerner at Sloan; Helen Gee at NIH; and Bernard Stein at NSF. Some supplemental funds to enhance the study were furnished by the Association of American Geographers, the American Psychological Association, and the American Psychological Foundation.

The committee is most appreciative of the cooperation it received from individuals in the 228 universities participating in the assessment. In particular we thank the university presidents and chancellors who agreed to participate and offered the assistance of staff members at their institutions; the graduate deans, department chairmen, and many other university personnel who helped to compile information about the research-doctorate programs at their own institutions; and the nearly 5,000 faculty members who took the time to complete and return reputational survey forms. This assessment would not have been feasible without the participation of these individuals. Nor would it have been complete without the suggestions from many individuals within and outside the academic community who reviewed the study plans and committee reports.

The committee also acknowledges the contributions of Francis Narin and Paul R. McAllister, whose innovative work in the area of publication productivity in science and engineering fields has been a valuable resource. We thank H. Roberts Coward and his colleagues at

the Institute for Scientific Information for their help in compiling publications data as well as William Batchelor and John James at NIH and David Staudt at NSF for their help in acquiring data on individual research grant awards.

Within the National Research Council many individuals have assisted in the planning and completion of this project. Robert A. Alberty, Harrison Shull, and W. K. Estes, former chairmen of the Commission on Human Resources, and William C. Kelly, Executive Director of the commission (now the Office of Scientific and Engineering Personnel), offered assistance and helpful counsel during all phases of the study. Lindsey R. Harmon and C. Alan Boneau contributed greatly to the planning of the assessment.

To Porter E. Coggeshall, Study Director, the committee expresses thanks for a job extremely well done. His ability to translate the committee's directions into compiled data and analyses must be given a large share of the credit for the completion of this project. He has been ably assisted by Prudence W. Brown, who supervised the data collection activities; Dorothy G. Cooper, who provided excellent secretarial support; George A. Boyce, whose programming expertise was invaluable; and Kathleen Drennan and Linda Dix, who helped in preparing final copy of the manuscript.

Committee on an Assessment of Quality-Related
Characteristics of Research-Doctorate Programs
in the United States

Preface

The genius of American higher education is often said to be in the close association of training and research--that is, in the nation's research-doctorate programs. Consequently, we are not surprised at the amount of worried talk about the quality of the research doctorate, for deterioration at that level will inevitably spread to wherever research skills are needed--and that indeed is a far-flung network of laboratories, institutes, firms, agencies, bureaus, and departments. What might surprise us, however, is the imbalance between the putative national importance of research-doctorate programs and the amount of sustained evaluative attention they themselves receive.

The present assessment, sponsored by the Conference Board of Associated Research Councils--comprised of the American Council of Learned Societies, the American Council on Education, the National Research Council (NRC), and the Social Science Research Council--seeks to correct the imbalance between worried talk and systematic study. In this effort the Conference Board continues a tradition pioneered by the American Council on Education, which in 1966 published An Assessment of Quality in Graduate Education, the report of a study conducted by Allan M. Cartter, and in 1970 published A Rating of Graduate Programs, by Kenneth D. Roose and Charles J. Andersen. The Cartter and Roose-Andersen reports have been widely used and frequently cited.

Some years after the release of the Roose-Andersen report, it was decided that the effort to assess the quality of research-doctorate programs should be renewed, and the Conference Board of Associated Research Councils agreed to sponsor an assessment. The Board of Directors of the American Council on Education concurred with the notion that the next study should be issued under these broader auspices. The NRC agreed to serve as secretariat for a new study. The responsible staff of the NRC earned the appreciation of the Conference Board for the skill and dedication shown during the course of securing funding and implementing the study. Special mention should also be made of the financial contribution of the National Academy of Sciences which, by supplementing funds available from external sources, made it possible for the study to get under way.

To sponsor a study comparing the quality of programs in 32

disciplines and from more than 200 doctorate-granting universities is to invite critics, friendly and otherwise. Such was the fate of the previous studies; such has been the fate of the present study. Scholarship, fortunately, can put criticism to creative use and has done so in this project. The study committee appointed by the Conference Board reviewed the criticisms of earlier efforts to assess research-doctorate programs, and it actively solicited criticisms and suggestions for improvements of its own design. Although constrained by limited funds, the committee applied state-of-the-art methodology in a design that incorporated the lessons learned from previous studies as well as attending to many critics of the present effort. Not all criticism has thus been stilled; nor could it ever be. Additional criticisms will be voiced by as many persons as begin to use the results of this effort in ways not anticipated by its authors. These criticisms will be welcome. The Conference Board believes that the present study, building on earlier criticisms and adopting a multidimensional approach to the assessment of research-doctorate programs, represents a substantial improvement over past reports. Nevertheless, each of the diverse measures used here has its own limitations, and none provides a precise index of the quality of a program for educating students for careers in research. No doubt a future study, taking into account the weaknesses as well as strengths of this effort, will represent still further improvement. One mark of success for the present study would be for it to take its place in a continuing series, thereby contributing to the indicator base necessary for informed policies that will maintain and perhaps enhance the quality of the nation's research-doctorate programs.

For the more immediate future the purposes of this assessment are to assist students and student advisers seeking the best match possible between individual career goals and the choice of an advanced degree program; to serve scholars whose study site is higher education and the nation's research enterprise; and to inform the practical judgment of the administrators, funders, and policymakers responsible for protecting the quality of scholarly education in the United States.

A remarkably hard-working and competent group, whose names appear on page vii of this report, oversaw the long process by which this study moved from the planning stage to the completion of these reports. The Conference Board expresses its warmest thanks to the members of its committee and especially to their co-chairmen, Lyle V. Jones and Gardner Lindzey.

Conference Board of Associated
Research Councils

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Study Director

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I

Origins of Study and Selection of Programs

Each year more than 22,000 candidates are awarded doctorates in engineering, the humanities, and the sciences from approximately 250 U.S. universities. They have spent, on the average, five-and-a-half years in intensive education and research in preparation for careers either in universities or in settings outside the academic sector, and many will make significant contributions to research. Yet we are poorly informed concerning the quality of the programs producing these graduates. This study is intended to provide information pertinent to this complex and controversial subject.

The charge to the study committee directed it to build upon the planning that preceded it. The planning stages included a detailed review of the methodologies and the results of past studies that had focused on the assessment of doctoral-level programs. The committee has taken into consideration the reactions of various groups and individuals to those studies. The present assessment draws upon previous experience with program evaluation, with the aim of improving what was useful and avoiding some of the difficulties encountered in past studies. The present study, nevertheless, is not purely reactive: it has its own distinctive features. First, it focuses only on programs awarding research doctorates and their effectiveness in preparing students for careers in research. Although other purposes of graduate education are acknowledged to be important, they are outside the scope of this assessment. Second, the study examines a variety of different indices that may be relevant to the program quality. This multidimensional approach represents an explicit recognition of the limitations of studies that rely entirely on peer ratings of perceived quality--the so-called reputational ratings. Finally, in the compilation of reputational ratings in this study, evaluators were provided the names of faculty members involved with each program to be rated and the number of research doctorates awarded in the last five years. In previous reputational studies evaluators were not supplied such information.

During the past two decades increasing attention has been given to describing and measuring the quality of programs in graduate education. It is evident that the assessment of graduate programs is highly important for university administrators and faculty, for employers in industrial and government laboratories, for graduate students and prospective graduate students, for policymakers in state and national organizations, and for private and public funding agencies. Past experience, however, has demonstrated the difficulties with such assessments and their potentially controversial nature. As one critic has asserted:

> . . . the overall effect of these reports seems quite clear. They tend, first, to make the rich richer and the poor poorer; second, the example of the highly ranked clearly imposes constraints on those institutions lower down the scale (the "Hertz-Avis" effect). And the effect of such constraints is to reduce diversity, to reward conformity or respectability, to penalize genuine experiment or risk. There is, also, I believe, an obvious tendency to promote the prevalence of disciplinary dogma and orthodoxy. All of this might be tolerable if the reports were tolerably accurate and judicious, if they were less prescriptive and more descriptive; if they did not pretend to "objectivity" and if the very fact of ranking were not pernicious and invidious; if they genuinely promoted a meaningful "meritocracy" (instead of simply perpetuating the *status quo ante* and an establishment mentality). But this is precisely what they cannot claim to be or do.[1]

The widespread criticisms of ratings in graduate education were carefully considered in the planning of this study. At the outset consideration was given to whether a national assessment of graduate programs should be undertaken at this time and, if so, what methods should be employed. The next two sections in this chapter examine the background and rationale for the decision by the Conference Board of Associated Research Councils[2] to embark on such a study. The remainder of the chapter describes the selection of disciplines and programs to be covered in the assessment.

The overall study encompasses a total of 2,699 graduate programs in 32 disciplines. In this report--the third of five reports issuing from the study--we examine 326 programs in four disciplines in engineering: chemical engineering, civil engineering, electrical engineering, and mechanical engineering. These programs account for more than 90 percent of the research doctorates awarded in these four disciplines. It should be emphasized that the selection of disciplines to be covered was determined on the basis of total doctoral awards during the FY1976-78 period (as described later in this chapter), and the exclusion of a particular discipline was in no way based on a judgment of the importance of graduate education or research in that discipline. Also, although the assessment is limited to programs leading to the research-doctorate (Ph.D. or equivalent) degree, the Conference Board and study committee recognize that graduate schools provide many other forms of valuable and needed education. It may be that in engineering, doctoral education constitutes a smaller portion of the total educational effort than in most science and humanities fields.

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[1] William A. Arrowsmith, "Preface" in *The Ranking Game: The Power of the Academic Elite*, by W. Patrick Dolan, University of Nebraska Printing and Duplicating Service, Lincoln, Nebraska, 1976, p. ix.

[2] The Conference Board includes representatives of the American Council of Learned Societies, American Council on Education, National Research Council, and Social Science Research Council.

PRIOR ATTEMPTS TO ASSESS QUALITY IN GRADUATE EDUCATION

Universities and affiliated organizations have taken the lead in the review of programs in graduate education. At most institutions program reviews are carried out on a regular basis and include a comprehensive examination of the curriculum and educational resources as well as the qualifications of faculty and students. One special form of evaluation is that associated with institutional accreditation:

> The process begins with the institutional or programmatic self-study, a comprehensive effort to measure progress according to previously accepted objectives. The self-study considers the interest of a broad cross-section of constituencies--students, faculty, administrators, alumni, trustees, and in some circumstances the local community. The resulting report is reviewed by the appropriate accrediting commission and serves as the basis for evaluation by a site-visit team from the accrediting group. . . . Public as well as educational needs must be served simultaneously in determining and fostering standards of quality and integrity in the institutions and such specialized programs as they offer. Accreditation, conducted through nongovernmental institutional and specialized agencies, provides a major means for meeting those needs.[3]

Although formal accreditation procedures play an important role in higher education, many university administrators do not view such procedures as an adequate means of assessing program quality. Other efforts are being made by universities to evaluate their programs in graduate education. The Educational Testing Service, with the sponsorship of the Council of Graduate Schools in the United States and the Graduate Record Examinations Board, has recently developed a set of procedures to assist institutions in evaluating their own graduate programs.[4]

---

[3] Council on Postsecondary Accreditation, The Balance Wheel for Accreditation, Washington, D.C., July 1981, pp. 2-3.

While reviews at the institutional (or state) level have proven useful in assessing the relative strengths and weaknesses of individual programs, they have not provided the information required for making national comparisons of graduate programs. Several attempts have been made at such comparisons. The most widely used of these have been the studies by Keniston (1959), Cartter (1966), and Roose and Andersen (1970). All three studies covered a broad range of disciplines in engineering, the humanities, and the sciences and were based on the opinions of knowledgeable individuals in the program areas covered. Keniston[5] surveyed the department chairmen at 25 leading institutions. The Cartter[6] and Roose-Andersen[7] studies compiled ratings from much larger groups of faculty peers. The stated motivation for these studies was to increase knowledge concerning the quality of graduate education:

> A number of reasons can be advanced for undertaking such a study. The diversity of the American system of higher education has properly been regarded by both the professional educator and the layman as a great source of strength, since it permits flexibility and adaptability and encourages experimentation and competing solutions to common problems. Yet diversity also poses problems. . . . Diversity can be a costly luxury if it is accompanied by ignorance. . . . Just as consumer knowledge and honest advertising are requisite if a competitive economy is to work satisfactorily, so an improved knowledge of opportunities and of quality is desirable if a diverse educational system is to work effectively.[8]

Although the program ratings from the Cartter and Roose-Andersen studies are highly correlated, some substantial differences in successive ratings can be detected for a small number of programs--suggesting changes in the programs or in the perception of these programs. For the past decade the Roose-Andersen ratings have generally been regarded as the best available source of information on the quality of doctoral programs. Although the ratings are now more than 10 years out of date and have been criticized on a variety of grounds, they are still used extensively by individuals within the academic community and by those in federal and state agencies.

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[4] For a description of these procedures, see M. J. Clark, Graduate Program Self-Assessment Service: Handbook for Users, Educational Testing Service, Princeton, New Jersey, 1980.

[5] H. Keniston, Graduate Study in Research in the Arts and Sciences at the University of Pennsylvania, University of Pennsylvania Press, Phildelphia, 1959.

[6] A. M. Cartter, An Assessment of Quality in Graduate Education, American Council on Education, Washington, D.C., 1966.

[7] K. D. Roose and C. J. Andersen, A Rating of Graduate Programs, American Council on Education, Washington, D.C., 1970.

[8] Cartter, p. 3.

A frequently cited criticism of the Cartter and Roose-Andersen studies is their exclusive reliance upon reputational measurement.

> The ACE rankings are but a small part of all the evaluative processes, but they are also the most public, and they are clearly based on the narrow assumptions and elitist structures that so dominate the present direction of higher education in the United States. As long as our most prestigious source of information about postsecondary education is a vague popularity contest, the resultant ignorance will continue to provide a cover for the repetitious aping of a single model. . . . All the attempts to change higher education will ultimately be strangled by the "legitimate" evaluative processes that have already programmed a single set of responses from the start.[9]

A number of other criticisms have been leveled at reputational rankings of graduate programs.[10] First, such studies inherently reflect perceptions that may be several years out of date and do not take into account recent changes in a program. Second, the ratings of individual programs are likely to be influenced by the overall reputation of the university--i.e., an institutional "halo effect." Also, a disproportionately large fraction of the evaluators are graduates of and/or faculty members in the largest programs, which may bias the survey results. Finally, on the basis of such studies it may not be possible to differentiate among many of the lesser known programs in which relatively few faculty members have established national reputations in research.

Despite such criticisms several studies based on methodologies similar to those employed by Cartter and Roose-Andersen have been carried out during the past 10 years. Some of these studies evaluated post-baccalaureate programs in areas not covered in the two earlier reports--including business, religion, educational administration, and medicine. Others have focused exclusively on programs in particular disciplines within the sciences and humanities. A few attempts have been made to assess graduate programs in a broad range of disciplines, many of which were covered in the Roose-Andersen and Cartter ratings, but in the opinion of many each has serious deficiencies in the methods and procedures employed. In addition to such studies, a myriad of articles have been written on the assessment of graduate programs since the release of the Roose-Andersen report. With the heightening interest in these evaluations, many in the academic community have recognized the need to assess graduate programs, using other criteria in addition to peer judgment.

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[9] Dolan, p. 81.

[10] For a discussion of these criticisms, see David S. Webster, "Methods of Assessing Quality," Change, October 1981, pp. 20-24.

> Though carefully done and useful in a number of ways, these ratings (Cartter and Roose-Andersen) have been criticized for their failure to reflect the complexity of graduate programs, their tendency to emphasize the traditional values that are highly related to program size and wealth, and their lack of timeliness or currency. Rather than repeat such ratings, many members of the graduate community have voiced a preference for developing ways to assess the quality of graduate programs that would be more comprehensive, sensitive to the different program purposes, and appropriate for use at any time by individual departments or universities.[11]

Several attempts have been made to go beyond the reputational assessment. Clark, Harnett, and Baird, in a pilot study[12] of graduate programs in chemistry, history, and psychology, identified as many as 30 possible measures significant for assessing the quality of graduate education. Glower[13] has ranked engineering schools according to the total amount of research spending and the number of graduates listed in Who's Who in Engineering. House and Yeager[14] rated economics departments on the basis of the total number of pages published by full professors in 45 leading journals in this discipline. Other ratings based on faculty publication records have been compiled for graduate programs in a variety of disciplines, including political science, psychology, and sociology. These and other studies demonstrate the feasibility of a national assessment of graduate programs that is founded on more than reputational standing among faculty peers.

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[11] Clark, p. 1.

[12] M. J. Clark, R. T. Harnett, and L. L. Baird, Assessing Dimensions of Quality in Doctoral Education: A Technical Report of a National Study in Three Fields, Educational Testing Service, Princeton, New Jersey, 1976.

[13] Donald D. Glower, "A Rational Method for Ranking Engineering Programs," Engineering Education, May 1980.

[14] Donald R. House and James H. Yeager, Jr., "The Distribution of Publication Success Within and Among Top Economics Departments: A Disaggregate View of Recent Evidence," Economic Inquiry, Vol. 16, No. 4, October 1978, pp. 593-598.

DEVELOPMENT OF STUDY PLANS

In September 1976 the Conference Board, with support from the Carnegie Corporation of New York and the Andrew W. Mellon Foundation, convened a three-day meeting to consider whether a study of programs in graduate education should be undertaken. The 40 invited participants in this meeting included academic administrators, faculty members, and agency and foundation officials,[15] and represented a variety of institutions, disciplines, and convictions. In these discussions there was considerable debate concerning whether the potential benefits of such a study outweighed the possible misrepresentations of the results. On the one hand, "a substantial majority of the Conference [participants believed] that the earlier assessments of graduate education have received wide and important use: by students and their advisors, by the institutions of higher education as aids to planning and the allocation of educational functions, as a check on unwarranted claims of excellence, and in social science research."[16] On the other hand, the Conference participants recognized that a new study assessing the quality of graduate education "would be conducted and received in a very different atmosphere than were the earlier Cartter and Roose-Andersen reports. . . . Where ratings were previously used in deciding where to increase funds and how to balance expanding programs, they might now be used in deciding where to cut off funds and programs."

After an extended debate of these issues, it was the recommendation of this conference that a study with particular emphasis on the effectiveness of doctoral programs in educating research personnel be undertaken. The recommendation was based principally on four considerations:

(1) the importance of the study results to national and state bodies,
(2) the desire to stimulate continuing emphasis on quality in graduate education,
(3) the need for current evaluations that take into account the many changes that have occurred in programs since the Roose-Andersen study, and
(4) the value of extending the range of measures used in evaluative studies of graduate programs.

Although many participants expressed interest in an assessment of master's degree and professional degree programs, insurmountable problems prohibited the inclusion of these types of programs in this study.

Following this meeting a 13-member committee,[17] co-chaired by

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[15] See Appendix G for a list of the participants in this conference.

[16] From a summary of the Woods Hole Conference (see Appendix G).

[17] See Appendix H for a list of members of the planning committee.

Gardner Lindzey and Harriet A. Zuckerman, was formed to develop a detailed plan for a study limited to research-doctorate programs and designed to improve upon the methodologies utilized in earlier studies. In its deliberations the planning committee carefully considered the criticisms of the Roose-Andersen study and other national assessments. Particular attention was paid to the feasibility of compiling a variety of specific measures (e.g., faculty publication records, quality of students, program resources) that were judged to be related to the quality of research-doctorate programs. Attention was also given to making improvements in the survey instrument and procedures used in the Cartter and Roose-Andersen studies. In September 1978 the planning group submitted a comprehensive report describing alternative strategies for an evaluation of the quality and effectiveness of research-doctorate programs.

> The proposed study has its own distinctive features. It is characterized by a sharp focus and a multidimensional approach. (1) It will focus only on programs awarding research doctorates; other purposes of doctoral training are acknowledged to be important, but they are outside the scope of the work contemplated. (2) The multidimensional approach represents an explicit recognition of the limitations of studies that make assessments solely in terms of ratings of perceived quality provided by peers--the so-called reputational ratings. Consequently, a variety of quality-related measures will be employed in the proposed study and will be incorporated in the presentation of the results of the study.[18]

This report formed the basis for the decision by the Conference Board to embark on a national assessment of doctorate-level programs in the sciences, engineering, and the humanities.

In June 1980 an 18-member committee was appointed to oversee the study. The committee,[19] made up of individuals from a diverse set of disciplines within the sciences, engineering, and the humanities, includes seven members who had been involved in the planning phase and several members who presently serve or have served as graduate deans in either public or private universities. During the first eight months the committee met three times to review plans for the study activities, make decisions on the selection of disciplines and programs to be covered, and design the survey instruments to be used. Early in the study an effort was made to solicit the views of presidents and graduate deans at more than 250 universities. Their suggestions were most helpful to the committee in drawing up final plans for the assessment. With the assistance of the Council of Graduate Schools in the United States, the committee and its staff have tried to keep the graduate deans informed about the progress being made in this study. The final section of this chapter describes the procedures followed in determining which research-doctorate programs were to be included in the assessment.

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[18] National Research Council, A Plan to Study the Quality and Effectiveness of Research-Doctorate Programs, 1978 (unpublished report).

[19] See p. vii of this volume for a list of members of the study committee.

SELECTION OF DISCIPLINES AND PROGRAMS TO BE EVALUATED

One of the most difficult decisions made by the study committee was the selection of disciplines to be covered in the assessment. Early in the planning stage it was recognized that some important areas of graduate education would have to be left out of the study. Limited financial resources required that efforts be concentrated on a total of no more than about 30 disciplines in the biological sciences, engineering, humanities, mathematical and physical sciences, and social sciences. At its initial meeting the committee decided that the selection of disciplines within each of these five areas should be made primarily on the basis of the total number of doctorates awarded nationally in recent years.

At the time the study was undertaken, aggregate counts of doctoral degrees earned during the FY1976-78 period were available from two independent sources--the Educational Testing Service (ETS) and the National Research Council (NRC). Table 1.1 presents doctoral awards data for 10 disciplines within engineering. As alluded to in footnote 1 of the table, discrepancies between the ETS and NRC counts may be explained, in part, by differences in the data collection procedures. The ETS counts, derived from information provided by universities, have been categorized according to the discipline of the department/academic unit in which the degree was earned. The NRC counts were tabulated from the survey responses of FY1976-78 Ph.D. recipients, who had been asked to identify their fields of specialty. Since separate totals for research doctorates in biomedical engineering, industrial and management engineering, materials engineering, and nuclear engineering were not available from the ETS manual, the committee made its selection of four disciplines primarily on the basis of the NRC data. In the case of electrical engineering, the ETS and NRC estimates of doctoral awards are highly discrepant.[20]

The selection of the research-doctorate programs to be evaluated in each discipline was made in two stages. Programs meeting any of the following three criteria were initially nominated for inclusion in the study:

(1) more than a specified number (see below) of research doctorates awarded during the FY1976-78 period,

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[20] See footnote 2 in Table 1.1.

TABLE 1.1 Number of Research-Doctorates Awarded in Engineering Disciplines, FY1976-78

	Source of Data[1]	
	ETS	NRC
Disciplines Included in the Assessment		
Electrical Engineering[2]	1,724	1,916
Mechanical Engineering	1,122	1,166
Civil Engineering	1,087	1,027
Chemical Engineering	856	881
Disciplines Not Included in the Assessment		
Aerospace/Aeronautical Engineering	809	747
Agricultural Engineering	583	755
Biomedical Engineering	N/A	347
Industrial & Management Engineering	N/A	340
Materials Engineering	N/A	227
Nuclear Engineering	N/A	113
Other Engineering	N/A	503

[1] Data on FY1976-78 doctoral awards were derived from two independent sources: Educational Testing Service (ETS), Graduate Programs and Admissions Manual, 1979-81, and NRC's Survey of Earned Doctorates, 1976-78. Differences in field definitions account for discrepancies between the ETS and NRC data.

[2] The ETS data may include some individuals from computer science departments who earned doctorates in the field of electrical engineering and consequently are not included in the NRC data.

(2) more than one-third of that specified number of doctorates awarded in FY1979, or

(3) an average rating of 2.0 or higher in the Roose-Andersen rating of the scholarly quality of departmental faculty.

In each discipline the specified number of doctorates required for inclusion in the study was determined in such a way that the programs meeting this criterion accounted for at least 90 percent of the doctorates awarded in that discipline during the FY1976-78 period. In the engineering disciplines the following numbers of FY1976-78 doctoral awards were required to satisfy the first criterion (above):

Chemical Engineering--5 or more doctorates
Civil Engineering--6 or more doctorates
Electrical Engineering--7 or more doctorates
Mechanical Engineering--7 or more doctorates

A list of the nominated programs at each institution was then sent to a designated individual (usually the graduate dean) who had been appointed by the university president to serve as study coordinator for the institution. The coordinator was asked to review the list and eliminate any programs no longer offering research doctorates or not belonging in the designated discipline. The coordinator also was given an opportunity to nominate additional programs that he or she believed should be included in the study.[21] Coordinators were asked to restrict their nominations to programs that they considered to be "of uncommon distinction" and that had awarded no fewer than two research doctorates during the past two years. In order to be eligible for inclusion, of course, programs had to belong in one of the disciplines covered in the study. If the university offered more than one research-doctorate program in a discipline, the coordinator was instructed to provide information on each of them so that these programs could be evaluated separately.

The committee received excellent cooperation from the study coordinators at universities. Of the 243 institutions that were identified as having one or more research-doctorate programs satisfying the criteria (listed earlier) for inclusion in the study, only 7 declined to participate in the study and another 8 failed to provide the program information requested within the three-month period allotted (despite several reminders). None of these 15 institutions had doctoral programs that had received strong or distinguished reputational ratings in prior national studies. Since the information requested had not been provided, the committee decided not to include programs from these institutions in any aspect of the assessment. In each of the four chapters that follows, a list is given of the universities that met the

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[21] See Appendix A for the specific instructions given to the coordinators.

TABLE 1.2 Number of Programs Evaluated in Each Discipline and the Total FY1976-80 Doctoral Awards from These Programs

Discipline	Programs	FY1976-80 Doctorates*
Chemical Engineering	79	1,405
Civil Engineering	74	1,583
Electrical Engineering	91	2,907
Mechanical Engineering	82	1,683
TOTAL	326	7,578

*The data on doctoral awards were provided by the study coordinator at each of the universities covered in the assessment.

criteria for inclusion in a particular discipline but that are not represented in the study.

As a result of nominations by institutional coordinators, some programs were added to the original list and others dropped. Table 1.2 reports the final coverage in each of the four engineering disciplines. The number of programs evaluated ranges from 91 in electrical engineering to 74 in civil engineering. Although the final determination of whether a program should be included in the assessment was left in the hands of the institutional coordinator, it is entirely possible that a few programs meeting the criteria for inclusion in the assessment were overlooked by the coordinators. During the course of the study only one such engineering program--in mechanical engineering--has been called to the attention of the committee.

In the chapter that follows, a detailed description is given of each of the measures used in the evaluation of research-doctorate programs in engineering. The description includes a discussion of the rationale for using the measure, the source from which data for that measure were derived, and any known limitations that would affect the interpretation of the data reported. The committee wishes to emphasize that there are limitations associated with each of the measures and that none of the measures should be regarded as a precise indicator of the quality of a program in educating engineers for careers in research. The reader is strongly urged to consider the descriptive material presented in Chapter II before attempting to interpret the program evaluations reported in subsequent chapters. In presenting a frank discussion of any shortcomings of each measure, the committee's intent is to reduce the possibility of misuse of the results from this assessment of research-doctorate programs.

II

Methodology

> Quality . . . you know what it is, yet you don't know what it is. But that's self-contradictory. But some things are better than others, that is, they have more quality. But when you try to say what the quality is, apart from the things that have it, it all goes poof! There's nothing to talk about. But if you can't say what Quality is, how do you know what it is, or how do you know that it even exists? If no one knows what it is, then for all practical purposes it doesn't exist at all. But for all practical purposes it really does exist. What else are the grades based on? Why else would people pay fortunes for some things and throw others in the trash pile? Obviously some things are better than others . . . but what's the "betterness"? . . . So round and round you go, spinning mental wheels and nowhere finding anyplace to get traction. What the hell is Quality? What is it?
>
> Robert M. Pirsig
> Zen and the Art of
> Motorcycle Maintenance

Both the planning committee and our own study committee have given careful consideration to the types of measures to be employed in the assessment of research-doctorate programs.[1] The committees recognized that any of the measures that might be used is open to criticism and that no single measure could be expected to provide an entirely satisfactory index of the quality of graduate education. With respect to the use of multiple criteria in educational assessment, one critic has commented:

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[1] A description of the measures considered may be found in the third chapter of the planning committee's report, along with a discussion of the relative merits of each measure.

> At best each is a partial measure encompassing a fraction of the large concept. On occasion its link to the real [world] is problematic and tenuous. Moreover, each measure [may contain] a load of irrelevant superfluities, "extra baggage" unrelated to the outcomes under study. By the use of a number of such measures, each contributing a different facet of information, we can limit the effect of irrelevancies and develop a more rounded and truer picture of program outcomes.[2]

Although the use of multiple measures alleviates the criticisms directed at a single dimension or measure, it certainly will not satisfy those who believe that the quality of graduate programs cannot be represented by quantitative estimates no matter how many dimensions they may be intended to represent. Furthermore, the usefulness of the assessment is dependent on the validity and reliability of the criteria on which programs are evaluated. The decision concerning which measures to adopt in the study was made primarily on the basis of two factors:

(1) the extent to which a measure was judged to be related to the quality of research-doctorate programs and
(2) the feasibility of compiling reliable data for making national comparisons of programs in particular disciplines.

Only measures that were applicable to a majority of the disciplines to be covered were considered. In reaching a final decision the study committee found the ETS study,[3] in which 27 separate variables were examined, especially helpful, even though it was recognized that many of the measures feasible in institutional self-studies would not be available in a national study. The committee was aided by the many suggestions received from university administrators and others within the academic community.

Although the initial design called for an assessment based on approximately six measures, the committee concluded that it would be highly desirable to expand this effort. A total of 16 measures (listed in Table 2.1) have been utilized in the assessment of research-doctorate programs in chemical engineering, civil engineering, electrical engineering, and mechanical engineering. For nine of the measures data are available describing most, if not all, of the engineering programs included in the assessment. For seven measures the coverage is less complete but encompasses at least a majority of the programs in

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[2] C. H. Weiss, Evaluation Research: Methods of Assessing Program Effectiveness, Prentice-Hall, Inc., Englewood Cliffs, New Jersey, 1972, p. 56.

[3] See M. J. Clark et al. (1976) for a description of these variables.

R6000-14.3

This page is a duplicate of Table 2.1 and may be used as a guide to program measures by placing it beside the tables under examination.

MEASURES COMPILED ON INDIVIDUAL RESEARCH-DOCTORATE PROGRAMS IN ENGINEERING

Program Size[1] (See pages 16-17.)
01 Reported number of faculty members in the program, December 1980.
02 Reported number of program graduates in last five years (July 1975 through June 1980).
03 Reported total number of full-time and part-time graduate students enrolled in the program who intend to earn doctorates, December 1980.

Characteristics of Graduates[2] (See pages 17-20.)
04 Fraction of FY1975-79 program graduates who had received some national fellowship or training grant support during their graduate education.
05 Median number of years from first enrollment in graduate school to receipt of the doctorate--FY1975-79 program graduates.[3]
06 Fraction of FY1975-79 program graduates who at the time they completed requirements for the doctorate reported that they had made definite commitments for postgraduation employment.
07 Fraction of FY1975-79 program graduates who at the time they completed requirements for the doctorate reported that they had made definite commitments for postgraduation employment in Ph.D.-granting universities.

Reputational Survey Results[4] (See pages 20-25.)
08 Mean rating of the scholarly quality of program faculty (scale = 0 to 5).
09 Mean rating of the effectiveness of the program in educating research scholars/scientists (scale = 0 to 3).
10 Mean rating of the improvement in program quality in the last five years (scale = 0 to 2).
11 Mean rating of the evaluators' familiarity with the work of the program's faculty (scale = 0 to 2).

University Library Size[5] (See page 25.)
12 Composite index describing the library size in the university in which the program is located, 1979-80 (scale = -3 to +3).

Research Support (See pages 26-27.)
13 Fraction of program faculty members holding research grants from the National Science Foundation, National Institutes of Health, or the Alcohol, Drug Abuse, and Mental Health Administration at any time during the FY1978-80 period.[6]
14 Total expenditures reported by the university for research and development activities in a specified field, FY1979[7] (in thousands of dollars).

Publication Records[8] (See pages 27-29.)
15 Number of published articles attributed to the program, 1978-79.
16 Estimated "overall influence" of published articles attributed to the program, 1978-79 (raw values are not reported).

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[1] Based on information provided to the committee by the participating universities.

[2] Based on data compiled in the NRC's Survey of Earned Doctorates.

[3] In reporting standardized scores and correlations with other variables, a shorter time-to-Ph.D. is assigned a higher score.

[4] Based on responses to the committee's survey conducted in April 1981.

[5] Based on data compiled by the Association of Research Libraries.

[6] Based on matching faculty names provided by institutional coordinators with the names of research grant awardees from the three federal agencies.

[7] Based on data provided to the National Science Foundation by universities.

[8] Based on data compiled by the Institute for Scientific Information and developed by Computer Horizons, Inc.

TABLE 2.1 Measures Compiled on Individual Research-Doctorate Programs in Engineering

Program Size[1]

01 Reported number of faculty members in the program, December 1980.
02 Reported number of program graduates in last five years (July 1975 through June 1980).
03 Reported total number of full-time and part-time graduate students enrolled in the program who intend to earn doctorates, December 1980.

Characteristics of Graduates[2]

04 Fraction of FY1975-79 program graduates who had received some national fellowship or training grant support during their graduate education.
05 Median number of years from first enrollment in graduate school to receipt of the doctorate--FY1975-79 program graduates.[3]
06 Fraction of FY1975-79 program graduates who at the time they completed requirements for the doctorate reported that they had made definite commitments for postgraduation employment.
07 Fraction of FY1975-79 program graduates who at the time they completed requirements for the doctorate reported that they had made definite commitments for postgraduation employment in Ph.D.-granting universities.

Reputational Survey Results[4]

08 Mean rating of the scholarly quality of program faculty.
09 Mean rating of the effectiveness of the program in educating research scholars/scientists.
10 Mean rating of the improvement in program quality in the last five years.
11 Mean rating of the evaluators' familiarity with the work of the program's faculty.

University Library Size[5]

12 Composite index describing the library size in the university in which the program is located, 1979-80.

Research Support

13 Fraction of program faculty members holding research grants from the National Science Foundation, National Institutes of Health, or the Alcohol, Drug Abuse, and Mental Health Administration at any time during the FY1978-80 period.[6]
14 Total expenditures (in thousands of dollars) reported by the university for research and development activities in a specified field, FY1979.[7]

Publication Records[8]

15 Number of published articles attributed to the program, 1978-79.
16 Estimated "overall influence" of published articles attributed to the program, 1978-79.

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[1] Based on information provided to the committee by the participating universities.
[2] Based on data compiled in the NRC's Survey of Earned Doctorates.
[3] In reporting standardized scores and correlations with other variables, a shorter time-to-Ph.D. is assigned a higher score.
[4] Based on responses to the committee's survey conducted in April 1981.
[5] Based on data compiled by the Association of Research Libraries.
[6] Based on matching faculty names provided by institutional coordinators with the names of research grant awardees from the three federal agencies.
[7] Based on data provided to the National Science Foundation by universities.
[8] Based on data compiled by the Institute for Scientific Information and developed by Computer Horizons, Inc.

every discipline. The actual number of programs evaluated on every measure is reported in the second table in each of the next four chapters.

The 16 measures describe a variety of aspects important to the operation and function of research-doctorate programs--and thus are relevant to the quality and effectiveness of programs in educating engineers for careers in research. However, not all of the measures may be viewed as "global indices of quality." Some, such as those relating to program size, are best characterized as "program descriptors" that, although not dimensions of quality per se, are thought to have a significant influence on the effectiveness of programs. Other measures, such as those relating to university library size and support for research and training, describe some of the resources generally recognized as being important in maintaining a vibrant program in graduate education. Measures derived from surveys of faculty peers or from the publication records of faculty members, on the other hand, have traditionally been regarded as indices of the overall quality of graduate programs. Yet these too are not true measures of quality.

> We often settle for an easy-to-gather statistic, perfectly legitimate for its own limited purposes, and then forget that we haven't measured what we want to talk about. Consider, for instance, the reputation approach of ranking graduate departments: We ask a sample of physics professors (say) which the best physics departments are and then tabulate and report the results. The "best" departments are those that our respondents say are the best. Clearly it is useful to know which are the highly regarded departments in a given field, but prestige (which is what we are measuring here) isn't exactly the same as quality.[*]

To be sure, each of the 16 measures reported in this assessment has its own set of limitations. In the sections that follow an explanation is provided of how each measure has been derived and its particular limitations as a descriptor of research-doctorate programs.

PROGRAM SIZE

Information was collected from the study coordinators at each university on the names and ranks of program faculty, doctoral student enrollment, and number of Ph.D. graduates in each of the past five years (FY1976-80). Each coordinator was instructed to include on the faculty list those individuals who, as of December 1, 1980, held academic appointments (typically at the rank of assistant, associate, and full professor) and who participated significantly in doctoral education. Emeritus and adjunct members generally were not to be included. Measure 01 represents the number of faculty identified in a program. Measure 02 is the reported number of graduates who earned Ph.D. or equivalent research doctorates in a program during the period from July 1, 1975, through June 30, 1980. Measure 03 represents the total number of full-time and part-time students reported to be enrolled in a program in the fall of 1980, who intended to earn research doctorates. All three of these measures describe different aspects of program size. In previous studies program size has been shown to be highly correlated with the reputational ratings of a program, and this relationship is examined in detail in this report. It should be noted that since the information was provided by the institutions participating in the study, the data may be influenced by the subjective decisions made by the individuals completing the forms. For example, some institutional coordinators may be far less restrictive than others in deciding who should be included on the list of program faculty. To minimize variation in interpretation, detailed instructions were provided to those filling out the forms.[5] Measure 03 is of particular concern in this regard since the coordinators at some institutions may not have known how many of the students currently enrolled in graduate study intended to earn doctoral degrees.

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[*] John Shelton Reed, "How Not to Measure What a University Does," The Chronicle of Higher Education, Vol. 22, No. 12, May 11, 1981, p. 56.

CHARACTERISTICS OF GRADUATES

One of the most meaningful measures of the success of a research-doctorate program is the performance of its graduates. How many go on to lead productive careers in research and/or other activity for which the Ph.D. provides entry? Unfortunately, reliable information on the subsequent employment and career achievements of the graduates of individual programs is not available. In the absence of this directly relevant information, the committee has relied on four indirect measures derived from data compiled in the NRC's Survey of Earned Doctorates.[6] Although each measure has serious limitations (described below), the committee believes it more desirable to include this information than not to include data about program graduates.

In identifying program graduates who had received their doctorates in the previous five years (FY1975-79),[7] the faculty lists furnished by the study coordinators at universities were compared with the names of dissertation advisers (available from the NRC survey). The latter source contains records for virtually all individuals who have earned research doctorates from U.S. universities since 1920. The institution, year, and specialty field of Ph.D. recipients were also used in determining the identity of program graduates. It is estimated that this matching process provided information on the graduate training and employment plans of more than 90 percent of the FY1975-79 graduates from the engineering programs. In the calculation of each of the four measures derived from the NRC survey, program data are reported only if the survey information is available on at least 10 graduates. Consequently, in the discipline with the fewest graduates per program--civil engineering--only slightly more than half the programs are included in these measures, whereas almost 90 percent of the electrical engineering programs are included.

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[5] A copy of the survey form and instructions sent to study coordinators is included in Appendix A.

[6] A copy of the questionnaire used in this survey is found in Appendix B.

[7] Survey data for the FY1980 Ph.D. recipients had not yet been compiled at the time this assessment was undertaken.

Measure 04 constitutes the fraction of FY1975-79 graduates of a program who had received at least some national fellowship support, including National Institutes of Health fellowships or traineeships, National Science Foundation fellowships, other federal fellowships, Woodrow Wilson fellowships, or fellowships/traineeships from other U.S. national organizations. One might expect the more selective programs to have a greater proportion of students with national fellowship support--especially "portable fellowships." Although the committee considered alternative measures of student ability (e.g., Graduate Record Examination scores, undergraduate grade point averages), reliable information of this sort was unavailable for a national assessment. It should be noted that the relevance of the fellowship measure varies considerably among disciplines. In the biomedical sciences a substantial fraction of the graduate students are supported by training grants and fellowships; in engineering the majority are supported by research assistantships and teaching assistantships.

Measure 05 is the median number of years elapsed from the time program graduates first enrolled in graduate school to the time they received their doctoral degrees. For purposes of analysis the committee has adopted the conventional wisdom that the most talented students are likely to earn their doctoral degrees in the shortest periods of time--hence, the shorter the median time-to-Ph.D., the higher the standardized score that is assigned. Although this measure has frequently been employed in social science research as a proxy for student ability, one must regard its use here with some skepticism. It is quite possible that the length of time it takes a student to complete requirements for a doctorate may be significantly affected by the explicit or implicit policies of a university or department. For example, in certain cases a short time-to-Ph.D. may be indicative of less stringent requirements for the degree. Furthermore, previous studies have demonstrated that women and members of minority groups, for reasons having nothing to do with their abilities, are more likely than male Caucasians to interrupt their graduate education or to be enrolled on a part-time basis.[8] As a consequence, the median time-to-Ph.D. may be longer for programs with larger fractions of women and minority students.

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[8] For a detailed analysis of this subject, see Dorothy M. Gilford and Joan Snyder, Women and Minority Ph.D.'s in the 1970's: A Data Book, National Academy of Sciences, Washington, D.C., 1977.

Measure 06 represents the fraction of FY1975-79 program graduates who reported at the time they had completed requirements for the doctorate that they had signed contracts or made firm commitments for postgraduation employment (including postdoctoral appointments as well as other positions in the academic or nonacademic sectors) and who provided the names of their prospective employers. Although this measure is likely to vary discipline by discipline according to the availability of employment opportunities, a program's standing relative to other programs in the same discipline should not be affected by this variation. In theory, the graduates with the greatest promise should have the easiest time in finding jobs. However, the measure is also influenced by a variety of other factors, such as personal job preferences and restrictions in geographic mobility, that are unrelated to the ability of the individual. It also should be noted parenthetically that unemployment rates for doctoral recipients are quite low and that nearly all of the graduates seeking jobs find positions soon after completing their doctoral programs.[9] Furthermore, first employment after graduation is by no means a measure of career achievement, which is what one would like to have if reliable data were available.

Measure 07, a variant of measure 06, constitutes the fraction of FY1975-79 program graduates who indicated that they had made firm commitments for employment in Ph.D.-granting universities and who provided the names of their prospective employers. This measure may be presumed to be an indication of the fraction of graduates likely to pursue careers in academic research, although there is no evidence concerning how many of them remain in academic research in the long term. In some disciplines the path from Ph.D. to postdoctoral apprenticeship to junior faculty has traditionally been regarded as the road of success for the growth and development of research talent. The committee is well aware, of course, that other paths, such as employment in the major laboratories of industry and government, provide equally attractive opportunities for growth. Indeed, in recent years increasing numbers of graduates are entering the nonacademic sectors. Unfortunately, the data compiled from the NRC's Survey of Earned Doctorates do not enable one to distinguish between employment in the top-flight laboratories of industry and government and employment in other areas of the nonacademic sectors. In each of the four engineering disciplines, more than half of the doctoral graduates accept first employment outside the academic sector (see Table 2.2), and many of the best qualified graduates in these and other disciplines undoubtedly are employed, as a matter of choice, in industrial or government laborato-

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[9] For new Ph.D. recipients in science and engineering the unemployment rate has been less than 2 percent (see National Research Council, Postdoctoral Appointments and Disappointments, National Academy Press, Washington, D.C., 1981, p. 313).

TABLE 2.2 Percentage of FY1975-79 Doctoral Recipients with Definite Commitments for Employment Outside the Academic Sector*

Chemical Engineering	74
Civil Engineering	51
Electrical Engineering	66
Mechanical Engineering	65

*Percentages are based on respondents to the NRC's Survey of Earned Doctorates who indicated that they had made firm commitments for postgraduation employment and who provided the names of their prospective employers. These percentages may be considered to be lower-bound estimates of the actual percentages of doctoral recipients employed outside the academic sector.

ries. Measure 07 reflects only academic employment; it is a program characteristic rather than a dimension of program quality.

The inclusion of measure 07 in this report has been an issue of great concern, much debated by the committee. The majority of the committee considers the measure to be of sufficient interest to warrant its inclusion. High values on measure 07 mark programs from which relatively large proportions of graduates accept first employmnt at academic institutions that award the Ph.D. degree. Having assembled data for measure 07 in all 32 disciplines covered in the assessment, the majority of the committee prefers that these data be reported, recognizing that readers will attend to them or not depending on their interest in this measure. Three members of the committee have objected to the majority position and object also to the inclusion of measure 06. Their views are presented in the Minority Statement, which follows Chapter VII in this report.

REPUTATIONAL SURVEY RESULTS

In April 1981, survey forms were mailed to a total of 975 faculty members in chemical engineering, civil engineering, electrical engineering, and mechanical engineering. The evaluators were selected from the faculty lists furnished by the study coordinators at the 228 universities covered in the assessment. These evaluators constituted approximately 16 percent of the total faculty population--6,196 faculty members--in the engineering programs being evaluated (see Table 2.3). The survey sample was chosen on the basis of the number of faculty in a particular program and the number of doctorates awarded in the previous five years (FY1976-80)--with the stipulation that at least one evaluator was selected from every program covered in the assessment. In selecting the sample each faculty rank was represented in proportion to the total number of individuals holding that rank, and preference was given to those faculty members whom the study coordinators had nominated to serve as evaluators. As shown in Table 2.3, 822 individuals, 84 percent of the survey sample in engineering, had been recommended by study coordinators.[10]

Each evaluator was asked to consider a stratified random sample of 50 research-doctorate programs in his or her discipline--with programs stratified by the number of faculty members associated with each program. Every program was included on 150 survey forms. The 50 programs to be evaluated appeared on a survey form in random sequence, preceded by an alphabetized list of all programs in that discipline that were being included in the study. No evaluator was asked to consider a program at his or her own institution. Ninety percent of the survey sample group were provided the names of faculty members in each of the 50 programs to be evaluated, along with data on the total number of doctorates awarded in the last five years.[11] The inclusion of this information represents a significant departure from the procedures used in earlier reputational assessments. For purposes of comparison with previous studies, 10 percent (randomly selected in each discipline) were not furnished any information other than the names of the programs.

The survey items were adapted from the form used in the Roose-Andersen study. Prior to mailing, the instrument was pretested using a small sample of faculty members in chemistry and psychology. As a result, two significant improvements were made in the original survey design. A question was added on the extent to which the evaluator was familiar with the work of the faculty in each program. Responses to this question, reported as measure 11, provide some insight into the relationship between faculty recognition and the reputational standing of a program.[12] Also added was a question on the evaluator's field of specialization--thereby making it possible to compare program evaluations in different specialty areas within a particular discipline.

A total of 579 faculty members in engineering--59 percent of those asked to participate--completed and returned survey forms (see Table 2.3). Two factors probably have contributed to this response rate being approximately 20 percentage points below the rates reported in the Cartter and Roose-Andersen studies.[13] First, because of the considerable expense of printing individualized survey forms (each 25-30 pages), second copies were not sent to sample members not responding to the first mailing[14]--as was done in the Cartter and Roose-Ander-

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[10] A detailed analysis of the survey participants in each discipline is given in subsequent chapters.

[11] This information was furnished to the committee by the study coordinators at the universities participating in the study.

[12] Evidence of the strength of the relationship is provided by correlations presented in Chapters III-VI, and an analysis of the relationship is provided in Chapter VII.

[13] To compare the response rates obtained in the earlier surveys, see Roose and Andersen, Table 28, p. 29.

[14] A follow-up letter was sent to those not responding to the first mailing, and a second copy was distributed to those few evaluators who specifically requested another form.

TABLE 2.3 Survey Response by Discipline and Characteristics of Evaluator

	Total Program Faculty	Survey Sample		
		Total	Respondents	
	N	N	N	%
Discipline of Evaluator				
Chemical Engineering	979	237	164	69
Civil Engineering	1,461	222	129	58
Electrical Engineering	2,134	273	142	52
Mechanical Engineering	1,622	243	144	59
Faculty Rank				
Professor	3,698	597	377	63
Associate Professor	1,401	244	123	50
Assistant Professor	1,008	132	79	60
Other	89	2	0	0
Evaluator Selection				
Nominated by Institution	1,901	822	518	63
Other	4,295	153	61	40
Survey Form				
With Faculty Names	N/A*	876	525	60
Without Names	N/A*	99	54	55
Total All Fields	6,196	975	579	59

*Not applicable.

sen efforts. Second, it is quite apparent that within the academic community there has been a growing dissatisfaction in recent years with educational assessments based on reputational measures. Indeed, this dissatisfaction was an important factor in the Conference Board's decision to undertake a multidimensional assessment, and some faculty members included in the sample made known to the committee their strong objections to the reputational survey.

As can be seen in Table 2.3, there is some variation in the response rates in the four engineering disciplines. Of particular interest is the relatively high rate of response from chemical engineers and the low rate from those in electrical engineering--the latter may be related to the difficulties encountered in distinguishing between electrical engineering and computer science program faculty members. It is not surprising to find that the evaluators nominated by study coordinators responded more often than did those who had been selected at random.

Each program was considered by an average of approximately 90 survey respondents from other programs in the same discipline. The evaluators were asked to judge programs in terms of scholarly quality of program faculty, effectiveness of program in educating research scholars/scientists, and change in program quality in the last five years.[15] The mean ratings of a program on these three survey items constitute measures 08, 09, and 10. Evaluators were also asked to indicate the extent to which they were familiar with the work of the program faculty. The average of responses to this item constitutes measure 11.

In making judgments about the quality of faculty, evaluators were instructed to consider the scholarly competence and achievements of the individuals. The ratings were furnished on the following scale:

5 Distinguished
4 Strong
3 Good
2 Adequate
1 Marginal
0 Not sufficient for doctoral education
X Don't know well enough to evaluate

In assessing the effectiveness of a program, evaluators were asked to consider the accessibility of faculty, the curricula, the instructional and research facilities, the quality of the graduate students, the performance of graduates, and other factors that contribute to a program's effectiveness. This measure was rated accordingly:

3 Extremely effective
2 Reasonably effective
1 Minimally effective
0 Not effective
X Don't know well enough to evaluate

Evaluators were instructed to assess change in program quality on the basis of whether there has been improvement in the last five years in both the scholarly quality of faculty and the effectiveness in educating research scholars/scientists. The following alternatives were provided:

2 Better than five years ago
1 Little or no change in last five years
0 Poorer than five years ago
X Don't know well enough to evaluate

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[15] A copy of the survey instrument and accompanying instructions is included in Appendix C.

Evaluators were asked to indicate their familiarity with the work of the program faculty according to the following scale:

2 Considerable familiarity
1 Some familiarity
0 Little or no familiarity

In the computation of mean ratings on measures 08, 09, and 10, the "don't know" responses were ignored. An average program rating based on fewer than 15 responses (excluding the "don't know" responses) is not reported.

Measures 08, 09, and 10 are subject to many of the same criticisms that have been directed at previous reputational surveys. Although care has been taken to improve the sampling design and to provide evaluators with some essential information about each program, the survey results merely reflect a consensus of faculty opinions. As discussed in Chapter I, these opinions may well be based on out-of-date information or be influenced by a variety of factors unrelated to the quality of the program. In Chapter VII a number of factors that may possibly affect the survey results are examined. In addition to these limitations, it should be pointed out that evaluators, on the average, were unfamiliar with almost one-third of the programs they were asked to consider.[16] As might be expected, the smaller and less prestigious programs were not as well known, and for this reason one might have less confidence in the average ratings of these programs. For all four survey measures, standard errors of the mean ratings are reported; they tend to be larger for the lesser known programs. The frequency of response to each of the survey items is discussed in Chapter VII.

Two additional comments should be made regarding the survey activity. First it should be emphasized that the ratings derived from the survey reflect a program's standing relative to other programs in the same discipline and provide no basis for making cross-disciplinary comparisons. For example, the fact that a larger number of chemical engineering programs received "distinguished" ratings on measure 08 than did electrical engineering programs indicates nothing about the relative quality of faculty in these two disciplines. Nor is it advisable to compare the rating of a program in one discipline with that of a program in another discipline because the ratings are based on the opinions of different groups of evaluators who were asked to judge entirely different sets of programs. Second, early in the committee's deliberations a decision was made to supplement the ratings obtained from faculty members with ratings from evaluators who hold research-oriented positions in institutions outside the academic sector. These institutions include industrial research laboratories, government research laboratories, and a variety of other research establishments. Over the past 10 years increasing numbers of doctoral recipients have taken positions outside the academic setting. The extensive involvement of these graduates in nonacademic employment is reflected in the percentages reported in Table 2.2: An average of as many as 65 percent of the recent graduates in engineering disciplines indicated that they planned to take positions in nonacademic settings. Data from another NRC survey suggest that the actual fraction employed outside academia may be significantly higher. The committee recognized that the inclusion of nonacademic evaluators would furnish information valuable for assessing nontraditional dimensions of doctoral education and would provide an important new measure not assessed in earlier studies. Results from a survey of this group would provide an interesting comparison with the results obtained from the survey of faculty members. A concentrated effort was made to obtain supplemental funding for adding nonacademic evaluators in selected disciplines to the survey sample, but this effort was unsuccessful. The committee nevertheless remains convinced of the importance of including evaluators from nonacademic research institutions. These institutions are likely to employ increasing fractions of graduates in many disciplines, and it is urged that this group not be overlooked in future assessments of graduate programs.

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[16] See Table 7.6 in Chapter VII.

UNIVERSITY LIBRARY SIZE

The university library holdings are generally regarded as an important resource for students in graduate (and undergraduate) education. The Association of Research Libraries (ARL) has compiled data from its academic member institutions and developed a composite measure of a university library's size relative to those of other ARL members. The ARL Library Index, as it is called, is based on 10 characteristics: volumes held, volumes added (gross), microform units held, current serials received, expenditures for library materials, expenditures for binding, total salary and wage expenditures, other operating expenditures, number of professional staff, and number of nonprofessional staff.[17] The 1979-80 index, which constitutes measure 12, is available for 89 of the 228 universities included in the assessment. (These 89 tend to be among the largest institutions.) The limited coverage of this measure is a major shortcoming. It should be noted that the ARL index is a composite description of library size and not a qualitative evaluation of the collections, services, or operations of the library. Also, it is a measure of aggregate size and does not take into account the library holdings in a particular department or discipline. Finally, although universities with more than one campus were instructed to include figures for the main campus only, some in fact may have reported library size for the entire system. Whether this misreporting occurred is not known.

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[17] See Appendix D for a description of the calculation of this index.

RESEARCH SUPPORT

Using computerized data files[18] provided by the National Science Foundation (NSF) and the National Institutes of Health (NIH), it was possible to identify which faculty members in each program had been awarded research grants during the FY1978-80 period by either of these agencies or by the Alcohol, Drug Abuse, and Mental Health Administration (ADAMHA). The fraction of faculty members in a program who had received any research grants from these agencies during this three-year period constitutes measure 13. Since these awards have been made on the basis of peer judgment, this measure is considered to reflect the perceived research competence of program faculty. However, it should be noted that significant amounts of support for research in engineering come from other federal agencies as well, but it was not feasible to compile data from these other sources. It is estimated[19] that 35 percent of the university faculty members in these disciplines who received federal R&D funding obtained their support from NSF and another 10 percent from NIH. The remaining 55 percent received support from the Department of Energy, Department of Defense, National Aeronautics and Space Administration, and other federal agencies. It also should be pointed out that only those faculty members who served as principal investigators or coinvestigators are counted in the computation of this measure.

Measure 14 describes the total FY1979 expenditures by a university for R&D in all fields of engineering. These data have been furnished to the NSF[20] by universities and include expenditures of funds from both federal and nonfederal sources. If an institution has more than one program being evaluated in the same discipline, the aggregate university expenditures for research in that discipline are reported for each of the programs. In each discipline data are recorded for the 100 universities with the largest R&D expenditures. Unfortunately, these data are available only for aggregate expenditures in engineering and are not for expenditures in the individual engineering disciplines; thus, the value reported for an individual program represents the total university expenditures in engineering.

This measure has several limitations related to the procedures by which the data have been collected. The committee notes that there is evidence within the source document[21] that universities employ varying practices for categorizing and reporting expenditures. Apparently, institutional support of research, industrial support of research, and expenditure of indirect costs are reported by different institutions in different categories (or not reported at all). Since measure 14 is based on total expenditures from all sources, the data used here are perturbed only when these types of expenditures are not subsumed under any reporting category. In contrast with measure 13, measure 14 is not reported on a scale relative to the number of faculty members and thus reflects the overall level of research activity at an institution in a particular discipline. Although research grants in the sciences and engineering provide some support for graduate students as well, these measures should not be confused with measure 04, which pertains to fellowships and training grants.

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[18] A description of these files is provided in Appendix E.

[19] Based on special tabulations of data from the NRC's Survey of Doctorate Recipients, 1979.

[20] A copy of the survey instrument used to collect these data appears in Appendix E.

[21] National Science Foundation, Academic Science: R and D Funds, Fiscal Year 1979, U.S. Government Printing Office, Washington, D.C., NSF 81-301, 1981.

PUBLICATION RECORDS

Data from the 1978 and the 1979 Science Citation Index have been compiled[22] on published articles associated with research-doctorate programs. Publication counts were associated with programs on the basis of the discipline of the journal in which an article appeared and the institution with which the author was affiliated. Coauthored articles were proportionately attributed to the institutions of the individual authors. Articles appearing in multidisciplinary journals (e.g., Science, Nature) were apportioned according to the characteristic mix of subject matter in those journals. For the purposes of assigning publication counts, this mix can be estimated with reasonable accuracy.[23]

Two measures have been derived from the publication records: measure 15--the total number of articles published in the 1978-79 period that have been associated with a research-doctorate program and measure 16--an estimation of the "influence" of these articles. The latter is a product of the number of articles attributed to a program and the estimated influence of the journals in which these articles appeared. The influence of a journal is determined from the weighted number of times, on the average, an article in that journal is cited--with references from frequently cited journals counting more heavily. A more detailed explanation of the derivation of these measures is given in Appendix F. Neither measure 15 nor measure 16 is based on actual counts of articles written only by program faculty. However, extensive analysis of the "influence" index in the fields of physics, chemistry, and biochemistry has demonstrated the stability of this index and the reliability associated with its use.[24] Of course, this does not imply that the measure captures subtle aspects of publication "influence." It is of interest to note that indices similar to measures 15 and 16 have been shown to be highly correlated with the peer ratings of graduate departments compiled in the Roose-Andersen study.[25]

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[22] The publication data have been generated for the committee's use by Computer Horizons, Inc., using source files provided by the Institute for Scientific Information.

[23] Francis Narin, Evaluative Bibliometrics: The Use of Publications and Citations Analysis in the Evaluation of Scientific Activity, Report to the National Science Foundation, March 1976, p. 203.

It must be emphasized that these measures encompass articles (published in selected journals) by all authors affiliated with a given university. Included therefore are articles by program faculty members, students and research personnel, and even members of other departments in that university who publish in those journals. Moreover, these measures do not take into account the differing sizes of programs, and the measures clearly do depend on faculty size. Although consideration was given to reporting the number of published articles per faculty member, the committee concluded that since the measure included articles by other individuals besides program faculty members, the aggregate number of articles would be a more reliable measure of overall program quality. It should be noted that if a university had more than one program being evaluated in the same discipline, it is not possible to distinguish the relative contribution of each program. In such cases the aggregate university data in that discipline were assigned to each program.

Since the data are confined to 1978-79, they do not take into account institutional mobility of authors after that period. Thus, articles by authors who have moved from one institution to another since 1979 are credited to the former institution. Also, the publication counts fail to include the contributions of faculty members' publications in journals outside their primary discipline. This point may be especially important for those programs with faculty members whose research is at the intersection of several different disciplines.

The reader should be aware of two additional caveats with regard to the interpretation of measures 15 and 16. First, both measures are based on counts of published articles and do not include books. Since in engineering most scholarly contributions are published as journal articles, this may not be a serious limitation. Second, the "influence" measure should not be interpreted as an indicator of the impact of articles by individual authors. Rather it is a measure of the impact of the journals in which articles associated with a particular program have been published. Citation counts, with all their difficulties, would have been preferable since they are attributable to individual authors and they register the impact of books as well as journal articles. However, the difficulty and cost of assembling reliable counts of articles by individual faculty members made their use infeasible.

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[24] Narin, pp. 283-307.

[25] Richard C. Anderson, Francis Narin, and Paul McAllister, "Publication Ratings Versus Peer Ratings of Universities," Journal of the American Society for Information Science, March 1978, pp. 91-103; and Lyle V. Jones, "The Assessment of Scholarship," New Directions for Program Evaluation, No. 6, 1980, pp. 1-20.

ANALYSIS AND PRESENTATION OF THE DATA

The next four chapters present all of the information that has been compiled on individual research-doctorate programs in chemical engineering, civil engineering, electrical engineering, and mechanical engineering. Each chapter follows a similar format, designed to assist the reader in the interpretation of program data. The first table in each chapter provides a list of the programs evaluated in a discipline--including the names of the universities and departments or academic units in which programs reside--along with the full set of data compiled for individual programs. Programs are listed alphabetically according to name of institution, and both raw and standardized values are given for all but one measure.[26] For the reader's convenience an insert of information from Table 2.1 is provided that identifies each of the 16 measures reported in the table and indicates the raw scale used in reporting values for a particular measure. Standardized values, converted from raw values to have a mean of 50 and a standard deviation of 10,[27] are computed for every measure so that comparisons can easily be made of a program's relative standing on different measures. Thus, a standardized value of 30 corresponds with a raw value that is two standard deviations below the mean for that measure, and a standardized value of 70 represents a raw value two standard deviations above the mean. While the reporting of values in standardized form is convenient for comparing a particular program's standing on different measures, it may be misleading in interpreting actual differences in the values reported for two or more programs--especially when the distribution of the measure being examined is highly skewed. For example, the numbers of published articles (measure 15) associated with four electrical engineering programs are reported in Table 5 1 as follows:

Program	Raw Value	Standardized Value
A	1	41
B	2	42
C	11	45
D	16	47

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[26] Since the scale used to compute measure 16--the estimated "influence" of published articles--is entirely arbitrary, only standardized values are reported for this measure.

[27] The conversion was made from the precise raw value rather than from the rounded value reported for each program. Thus, two programs may have the same reported raw value for a particular measure but different standardized values.

Although programs C and D have many times the number of articles as have programs A and B, the differences reported on a standardized scale appear to be small. Thus, the reader is urged to take note of the raw values before attempting to interpret differences in the standardized values given for two or more programs.

The initial table in each chapter also presents estimated standard errors of mean ratings derived from the four survey items (measures 08-11). A standard error is an estimated standard deviation of the sample mean rating and may be used to assess the stability of a mean rating reported for a particular program.[28] For example, one may assert (with .95 confidence) that the population mean rating would lie within two standard errors of the sample mean rating reported in this assessment.

No attempt has been made to establish a composite ranking of programs in a discipline. Indeed, the committee is convinced that no single measure adequately reflects the quality of a research-doctorate program and wishes to emphasize the importance of viewing individual programs from the perspective of multiple indices or dimensions.

The second table in each chapter presents summary statistics (i.e., number of programs evaluated, mean, standard deviation, and decile values) for each of the program measures.[29] The reader should find these statistics helpful in interpreting the data reported on individual programs. Next is a table of the intercorrelations among the various measures for that discipline. This table should be of particular interest to those desiring information about the interrelations of the various measures.

The remainder of each chapter is devoted to an examination of results from the reputational survey. Included are an analysis of the characteristics of survey participants and graphical portrayals of the relationship of mean rating of scholarly quality of faculty (measure 08) with number of faculty (measure 01) and the relationship of mean rating of program effectiveness (measure 09) with the number of graduates (measure 02). A frequently mentioned criticism of the Roose-Andersen and Cartter studies is that small but distinguished programs have been penalized in the reputational ratings because they are not as highly visible as larger programs of comparable quality. The comparisons of survey ratings with measures of program size are presented as the first two figures in each chapter and provide evidence about the number of small programs in each discipline that have received high reputational ratings. Since in each case the reputational rating is more highly correlated with the square root of program size than with the size measure itself, measures 01 and 02 are plotted on a square root scale.[30] To assist the reader in interpreting results of the survey evaluations, each chapter concludes with a graphical presentation of the mean rating for every program of the scholarly quality of faculty (measure 08) and an associated "confidence interval" of 1.5 standard errors. In comparing the mean ratings of two programs, if their reported confidence intervals of 1.5 standard errors do not overlap, one may safely conclude that the program ratings are significantly different (at the .05 level of significance)--i.e., the observed difference in mean ratings is too large to be plausibly attributable to sampling error.[31]

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[28] The standard error estimate has been computed by dividing the standard deviation of a program's ratings by the square root of the number of ratings. For a more extensive discussion of this topic, see Fred N. Kerlinger, Foundations of Behavioral Research, Holt, Reinhart, and Winston, Inc., New York, 1973, Chapter 12. Readers should note that the estimate is a measure of the variation in response and by no means includes all possible sources of error.

[29] Standardized scores have been computed from precise values of the mean and standard deviation of each measure and not the rounded values reported in the second table of each chapter.

The final chapter of this report gives an overview of the evaluation process in the four engineering disciplines and includes a summary of general findings. Particular attention is given to some of the extraneous factors that may influence program ratings of individual evaluators and thereby distort the survey results. The chapter concludes with a number of specific suggestions for improving future assessments of research-doctorate programs.

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[30] For a general discussion of transforming variables to achieve linear fits, see John W. Tukey, Exploring Data Analysis, Addison-Wesley, Reading, Massachusetts, 1977.

[31] This rule for comparing nonoverlapping intervals is valid as long as the ratio of the two estimated standard errors does not exceed 2.41. (The exact statistical significance of this criterion then lies between .050 and .034.) Inspection of the standard errors reported in each discipline shows that for programs with mean ratings differing by less than 1.0 (on measure 08), the standard error of one mean very rarely exceeds twice the standard error of another.

III

Chemical Engineering Programs

In this chapter 79 research-doctorate programs in chemical engineering are assessed. These programs, according to the information supplied by their universities, have accounted for 1,405 doctoral degrees awarded during the FY1976-80 period--approximately 97 percent of the aggregate number of chemical engineering doctorates earned from U.S. universities in this five-year span.[1] On the average, 24 full-time and part-time students intending to earn doctorates were enrolled in a program in December 1980, with an average faculty size of 12 members.[2] Only three of the programs were initiated since 1970, and no two programs are located in the same university. In addition to the 79 institutions represented in this discipline, one other--Colorado School of Mines--was initially identified as meeting the criteria[3] for inclusion in the assessment. However, this institution chose not to participate in the assessment in *any* discipline.

Before examining individual program results presented in Table 3.1, the reader is urged to refer to Chapter II, in which each of the 16 measures used in the assessment is discussed. Summary statistics describing every measure are given in Table 3.2. For 10 of the measures, data are reported for at least 69 of the 79 chemical engineering programs. For measures 04-07, which pertain to characteristics of the program graduates, data are presented for only approximately three-fourths of the programs; the other fourth had too few graduates on which to base statistics.[4] For measure 12, a composite index of the size of a university library, data are available for 52 programs. The programs not evaluated on this measure are typically smaller--in terms of faculty size and graduate student enrollment--than other chemical engineering programs. With respect to measure 13, the fraction of faculty with research support from the National Science Foundation, the National Institutes of Health, and the Alcohol, Drug Abuse, and Mental Health Administration, data are reported for 55 programs that had at least 10 faculty members. Were data on measure 12 and 13 available for all 79 programs, it is likely that the reported means would be appreciably lower (and that some of the correlations of these measures with others would be higher).

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[1] Data from the NRC's Survey of Earned Doctorates indicate that 1,453 research doctorates in chemical engineering were awarded by U.S. universities between FY1976 and FY1980.

[2] See the reported means for measures 03 and 01 in Table 3.2.

[3] As mentioned in Chapter I, the primary criterion for inclusion was that a university had awarded 5 or more doctorates in chemical engineering during the FY1976-78 period.

[4] As mentioned in Chapter II, data for measures 04-07 are not reported if they are based on the survey responses of fewer than 10 FY1975-79 program graduates.

Intercorrelations among the 16 measures (Pearson product-moment coefficients) are given in Table 3.3. Of particular note are the high positive correlations of the measures of the numbers of recent graduates (02) and numbers of students (03) with the measures of publication records (15, 16) and reputational survey ratings (08, 09). Figure 3.1 illustrates the relation between the mean rating of the scholarly quality of faculty (measure 08) and the number of faculty members (measure 01) for each of 79 programs in chemical engineering. Figure 3.2 plots the mean rating of program effectiveness (measure 09) against the total number of FY1976-80 program graduates (measure 02). Although in both figures there is a significant positive correlation between program size and reputational rating, it is quite apparent that some of the smaller programs received high mean ratings and that some of the larger programs received low mean ratings.

Table 3.4 describes the 164 faculty members who participated in the evaluation of chemical engineering programs. These individuals constituted 69 percent of those asked to respond to the survey in this discipline and 17 percent of the faculty population in the 79 research-doctorate programs being evaluated.[5] More than one-third of the survey participants had earned their highest degree since 1970, and a majority held the rank of full professor.

To assist the reader in interpreting results of the survey evaluations, estimated standard errors have been computed for mean ratings of the scholarly quality of faculty in 79 chemical engineering programs (and are given in Table 3.1). For each program the mean rating and an associated "confidence interval" of 1.5 standard errors are illustrated in Figure 3.3 (listed in order of highest to lowest mean rating). In comparing two programs, if their confidence intervals do not overlap, one may conclude that there is a significant difference in their mean ratings at a .05 level of significance.[6] From this figure it is also apparent that one should have somewhat more confidence in the accuracy

of the mean ratings of higher-rated programs than lower-rated programs. This generalization results primarily from the fact that evaluators are not as likely to be familiar with the less prestigious programs, and consequently the mean ratings of these programs are usually based on fewer survey responses.

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[5] See Table 2.3 in Chapter II.

[6] See pp. 29-31 for a discussion of the interpretation of mean ratings and associated confidence intervals.

TABLE 3.1 Program Measures (Raw and Standardized Values) in Chemical Engineering

Prog No.	University - Department/Academic Unit	Program Size			Characteristics of Program Graduates			
		(01)	(02)	(03)	(04)	(05)	(06)	(07)
001.	Akron, University of *Chemical Engineering*	6 *37*	9 *43*	4 *41*	.18 *45*	7.0 *36*	.82 *53*	.09 *44*
002.	Auburn University *Chemical Engineering**	5 *35*	3 *39*	12 *44*	NA	NA	NA	NA
003.	Brigham Young University *Chemical Engineering*	14 *53*	10 *44*	8 *43*	NA	NA	NA	NA
004.	CUNY-Graduate School *Engineering*	7 *39*	10 *44*	12 *44*	.69 *81*	7.3 *33*	.92 *61*	.00 *34*
005.	California Institute of Technology *Chemical Engineering*	11 *47*	32 *61*	68 *70*	.35 *57*	5.9 *51*	.79 *51*	.21 *57*
006.	California, University of-Berkeley *Chemical Engineering*	23 *71*	65 *85*	96 *83*	.24 *50*	5.6 *55*	.95 *63*	.21 *57*
007.	California, University of-Los Angeles *Engineering and Applied Science*	10 *45*	7 *42*	33 *54*	NA	NA	NA	NA
008.	Carnegie-Mellon University *Chemical Engineering*	15 *55*	31 *60*	40 *57*	.29 *53*	5.5 *56*	.84 *55*	.16 *52*
009.	Case Western Reserve University *Chemical Engineering*	11 *47*	8 *43*	6 *42*	NA	NA	NA	NA
010.	Catholic University of America *Chemical Engineering*	9 *43*	10 *44*	5 *41*	.27 *52*	5.3 *59*	.64 *39*	.09 *44*
011.	Cincinnati, University of *Chemical Engineering*	10 *45*	6 *41*	10 *43*	NA	NA	NA	NA
012.	Clarkson College of Technology *Chemical Engineering*	17 *59*	12 *46*	31 *53*	.15 *43*	5.3 *58*	.58 *35*	.00 *34*
013.	Clemson University *Chemical Engineering*	11 *47*	6 *41*	2 *40*	.27 *52*	6.2 *46*	.82 *53*	.36 *74*
014.	Colorado, University of *Chemical Engineering*	12 *49*	11 *45*	NA	.47 *65*	6.5 *43*	.80 *52*	.27 *63*
015.	Columbia University *Chemical Engineering and Applied Chemistry*	10 *45*	26 *56*	23 *49*	.16 *44*	6.0 *49*	.83 *54*	.17 *52*
016.	Connecticut, University of-Storrs *Chemical Engineering*	12 *49*	7 *42*	12 *44*	NA	NA	NA	NA
017.	Cornell University-Ithaca *Chemical Engineering*	15 *55*	14 *47*	26 *51*	.00 *33*	5.3 *59*	.75 *48*	.00 *34*
018.	Delaware, University of-Newark *Chemical Engineering*	17 *59*	30 *59*	52 *63*	.54 *70*	5.4 *57*	.82 *53*	.21 *57*
019.	Florida, University of-Gainesville *Chemical Engineering*	13 *51*	19 *51*	35 *55*	.29 *53*	5.8 *52*	.48 *27*	.10 *45*
020.	Georgia Institute of Technology *Chemical Engineering*	19 *63*	13 *46*	7 *42*	.10 *40*	NA	.80 *52*	.10 *45*

* indicates program was initiated since 1970.

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TABLE 3.1 Program Measures (Raw and Standardized Values) in Chemical Engineering

Prog No.	Survey Results				University Library	Research Support		Published Articles		Survey Ratings Standard Error			
	(08)	(09)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(08)	(09)	(10)	(11)
001.	0.9	0.5	0.9	0.3	NA	NA	NA	1		.10	.09	.08	.05
	32	29	42	34				40	41				
002.	1.2	0.8	1.0	0.7	NA	NA	2450	9		.11	.09	.09	.07
	34	34	49	43			44	49	54				
003.	2.4	1.5	1.2	0.8	-0.6	.29	NA	8		.09	.07	.07	.07
	47	48	55	47	42	45		48	52				
004.	2.7	1.6	0.9	0.9	NA	NA	NA	6		.09	.06	.07	.07
	51	51	42	48				45	48				
005.	4.7	2.7	1.5	1.7	NA	.46	8339	11		.05	.05	.06	.05
	71	70	67	68		55	51	51	52				
006.	4.6	2.6	1.0	1.7	2.2	.44	16448	37		.06	.06	.06	.05
	71	70	48	70	69	54	60	82	91				
007.	2.6	1.4	1.6	0.8	2.0	.50	6168	4		.10	.07	.07	.07
	49	47	69	48	67	58	48	43	45				
008.	3.6	2.2	0.9	1.4	NA	.33	6409	8		.07	.04	.09	.06
	60	61	44	62		48	48	48	48				
009.	2.8	1.8	1.0	0.9	-1.3	.27	8676	6		.10	.07	.06	.06
	51	53	46	49	36	44	51	45	47				
010.	1.1	0.6	0.7	0.4	NA	NA	NA	1		.10	.09	.10	.05
	34	32	36	36				40	40				
011.	2.1	1.3	0.9	0.7	-0.2	.30	2360	2		.08	.08	.06	.06
	44	44	45	43	46	46	44	41	43				
012.	2.5	1.6	0.9	0.9	NA	.35	1791	9		.07	.07	.09	.07
	48	50	44	50		49	43	49	49				
013.	1.7	1.1	0.9	0.5	NA	.09	4356	3		.10	.09	.08	.06
	39	40	43	40		33	46	42	42				
014.	3.0	1.7	1.2	1.2	-0.9	.33	1849	2		.08	.06	.06	.05
	53	53	54	58	40	48	43	41	42				
015.	2.3	1.5	0.8	0.8	1.7	.20	5375	5		.09	.07	.08	.07
	47	48	39	46	65	40	47	44	44				
016.	2.6	1.5	1.4	0.9	-0.5	.33	4069	6		.08	.07	.07	.06
	49	48	63	50	43	48	46	45	48				
017.	3.4	2.0	1.4	1.3	1.6	.27	13206	10		.07	.06	.07	.06
	57	57	62	58	63	44	56	50	50				
018.	4.5	2.5	1.0	1.7	NA	.77	3302	25		.06	.05	.07	.05
	69	67	46	70		74	45	68	74				
019.	3.0	1.9	0.9	1.0	0.8	.23	13686	14		.07	.04	.08	.06
	54	55	45	53	55	41	57	55	51				
020.	2.6	1.6	1.6	1.0	NA	.32	29270	7		.08	.06	.07	.06
	50	50	69	51		47	74	47	46				

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TABLE 3.1 Program Measures (Raw and Standardized Values) in Chemical Engineering

Prog No.	University - Department/Academic Unit	Program Size (01)	Program Size (02)	Program Size (03)	Characteristics of Program Graduates (04)	Characteristics of Program Graduates (05)	Characteristics of Program Graduates (06)	Characteristics of Program Graduates (07)
021.	Houston, University of	12	35	45	.28	5.7	.84	.24
	Chemical Engineering	*49*	*63*	*60*	*52*	*53*	*55*	*60*
022.	Idaho, University of-Moscow	5	6	4	NA	NA	NA	NA
	Chemical Engineering	*35*	*41*	*41*				
023.	Illinois Institute of Technology	6	17	19	.26	6.3	.39	.06
	Chemical Engineering	*37*	*49*	*48*	*51*	*45*	*20*	*40*
024.	Illinois, University-Urbana/Champaign	11	43	74	.30	4.9	.91	.11
	Chemical Engineering	*47*	*69*	*73*	*54*	*64*	*60*	*46*
025.	Iowa State University-Ames	16	24	27	.20	6.2	.75	.15
	Chemical Engineering	*57*	*55*	*51*	*47*	*46*	*48*	*50*
026.	Kansas State University-Manhattan	9	7	15	.09	7.4	.64	.09
	Chemical Engineering	*43*	*42*	*46*	*39*	*31*	*39*	*44*
027.	Kansas, University of	13	6	12	NA	NA	NA	NA
	Chemical and Petroleum Engineering	*51*	*41*	*44*				
028.	Kentucky, University of	10	8	9	NA	NA	NA	NA
	Chemical Engineering	*45*	*43*	*43*				
029.	Lehigh University	14	23	20	.08	5.8	.78	.09
	Chemical Engineering	*53*	*54*	*48*	*38*	*52*	*50*	*44*
030.	Louisiana State University-Baton Rouge	14	17	21	.21	5.9	.84	.16
	Chemical Engineering	*53*	*49*	*49*	*47*	*51*	*55*	*51*
031.	Maryland, University of-College Park	12	24	13	.20	6.4	.75	.04
	Chemical and Nuclear Engineering	*49*	*55*	*45*	*47*	*44*	*48*	*38*
032.	Massachusetts Institute of Technology	28	47	99	.26	6.2	.76	.24
	Chemical Engineering	*81*	*72*	*84*	*51*	*46*	*49*	*60*
033.	Massachusetts, University of-Amherst	14	22	27	.33	4.9	1.00	.20
	Chemical Engineering	*53*	*53*	*51*	*56*	*64*	*67*	*56*
034.	Michigan State University-East Lansing	9	5	23	NA	NA	NA	NA
	Chemical Engineering	*43*	*40*	*49*				
035.	Michigan, University of-Ann Arbor	19	24	27	.20	6.5	.80	.20
	*Chemical Engineering**	*63*	*55*	*51*	*47*	*43*	*52*	*56*
036.	Minnesota, University of	20	55	72	.20	5.3	.82	.26
	Chemical Engineering and Materials Science	*65*	*78*	*72*	*46*	*58*	*54*	*62*
037.	Missouri, University of-Columbia	10	6	5	NA	NA	NA	NA
	Chemical Engineering	*45*	*41*	*41*				
038.	Missouri, University of-Rolla	15	15	18	.24	5.3	.82	.12
	Chemical Engineering	*55*	*48*	*47*	*49*	*59*	*54*	*47*
039.	Montana State University-Bozeman	5	6	4	NA	NA	NA	NA
	Chemical Engineering	*35*	*41*	*41*				
040.	New Jersey Institute of Technology	28	4	NA	NA	NA	NA	NA
	Chemistry and Chemical Engineering	*81*	*40*					

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TABLE 3.1 Program Measures (Raw and Standardized Values) in Chemical Engineering

Prog No.	Survey Results				University Library	Research Support		Published Articles		Survey Ratings Standard Error			
	(08)	(09)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(08)	(09)	(10)	(11)
021.	4.1	2.2	1.7	1.6	-0.9	.50	5015	29		.08	.05	.06	.06
	65	*61*	*74*	*66*	*40*	*58*	*47*	*73*	*70*				
022.	1.0	0.8	0.7	0.4	NA	NA	NA	3		.10	.10	.10	.06
	33	*35*	*37*	*36*				*42*	*43*				
023.	2.4	1.5	0.7	1.0	NA	NA	NA	7		.08	.06	.06	.07
	47	*48*	*36*	*53*				*47*	*45*				
024.	4.0	2.4	0.7	1.5	2.0	.73	18980	12		.07	.06	.06	.06
	64	*66*	*37*	*63*	*67*	*71*	*63*	*53*	*52*				
025.	3.1	1.9	1.2	1.0	-0.5	.19	8330	11		.08	.05	.08	.07
	54	*56*	*55*	*53*	*43*	*39*	*51*	*51*	*54*				
026.	2.1	1.3	0.9	0.6	NA	NA	2604	20		.09	.06	.04	.07
	44	*44*	*45*	*43*			*44*	*62*	*56*				
027.	2.1	1.2	1.0	0.5	0.1	.31	1707	3		.11	.09	.05	.06
	44	*43*	*46*	*39*	*49*	*46*	*43*	*42*	*42*				
028.	1.8	1.2	1.1	0.5	-0.1	.20	5056	17		.08	.08	.07	.06
	41	*42*	*51*	*41*	*47*	*40*	*47*	*59*	*56*				
029.	2.7	1.7	1.1	0.9	NA	.36	4568	11		.08	.06	.07	.06
	50	*53*	*51*	*50*		*49*	*46*	*51*	*51*				
030.	2.3	1.4	1.1	0.7	-0.3	.00	4130	3		.09	.07	.07	.06
	47	*47*	*49*	*43*	*45*	*28*	*46*	*42*	*41*				
031.	2.4	1.5	0.9	0.7	0.2	.50	3519	6		.08	.07	.07	.06
	47	*48*	*44*	*45*	*50*	*58*	*45*	*45*	*46*				
032.	4.3	2.4	1.3	1.6	-0.3	.43	59143	26		.06	.05	.07	.05
	67	*65*	*57*	*66*	*45*	*53*	*99*	*69*	*72*				
033.	3.2	1.9	1.5	1.2	-0.7	.43	2256	14		.07	.05	.07	.06
	55	*56*	*65*	*56*	*41*	*53*	*44*	*55*	*59*				
034.	1.9	1.1	1.0	0.6	0.3	NA	2247	2		.11	.08	.09	.07
	42	*40*	*47*	*42*	*51*		*44*	*41*	*40*				
035.	3.4	1.9	0.5	1.4	1.8	.42	19835	9		.08	.05	.06	.06
	57	*57*	*29*	*63*	*65*	*53*	*64*	*49*	*49*				
036.	4.9	2.8	1.1	1.7	1.2	.60	8726	22		.07	.04	.07	.05
	73	*73*	*50*	*70*	*59*	*64*	*51*	*65*	*64*				
037.	2.0	1.2	1.0	0.6	-0.2	.20	1976	1		.08	.08	.06	.07
	43	*43*	*49*	*43*	*46*	*40*	*43*	*40*	*40*				
038.	2.4	1.5	1.2	0.7	NA	.20	3606	7		.09	.07	.08	.06
	47	*47*	*55*	*45*		*40*	*45*	*47*	*49*				
039.	1.0	0.7	0.6	0.4	NA	NA	1689	1		.10	.08	.10	.05
	33	*34*	*31*	*37*			*43*	*40*	*41*				
040.	1.7	0.9	1.1	0.5	NA	.07	NA	0		.12	.09	.07	.06
	40	*37*	*51*	*40*		*32*		*38*	*39*				

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TABLE 3.1 Program Measures (Raw and Standardized Values) in Chemical Engineering

Prog No.	University - Department/Academic Unit	Program Size (01)	Program Size (02)	Program Size (03)	Characteristics of Program Graduates (04)	Characteristics of Program Graduates (05)	Characteristics of Program Graduates (06)	Characteristics of Program Graduates (07)
041.	North Carolina State University-Raleigh	10	20	17	.14	5.3	.86	.05
	Chemical Engineering	*45*	*52*	*47*	*42*	*58*	*57*	*39*
042.	Northwestern University	20	33	30	.24	6.2	.70	.03
	Chemical Engineering	*65*	*61*	*53*	*50*	*46*	*44*	*38*
043.	Notre Dame, University of	6	14	17	.31	4.2	.77	.15
	Chemical Engineering	*37*	*47*	*47*	*54*	*73*	*49*	*51*
044.	Ohio State University-Columbus	13	16	30	.11	6.1	.89	.22
	Chemical Engineering	*51*	*49*	*53*	*40*	*47*	*59*	*58*
045.	Oklahoma State University-Stillwater	9	15	12	.21	7.5	1.00	.14
	Chemical Engineering	*43*	*48*	*44*	*48*	*30*	*67*	*50*
046.	Oklahoma, University of-Norman	12	16	13	.15	6.1	.71	.14
	Chemical Engineering and Materials Science	*49*	*49*	*45*	*43*	*47*	*45*	*50*
047.	Oregon State University-Corvallis	7	4	4	NA	NA	NA	NA
	Chemical Engineering	*39*	*40*	*41*				
048.	Pennsylvania State University	13	23	24	.11	6.8	.77	.12
	Chemical Engineering	*51*	*54*	*50*	*40*	*38*	*49*	*47*
049.	Pennsylvania, University of	11	30	33	.33	5.6	.85	.35
	Chemical Engineering	*47*	*59*	*54*	*56*	*54*	*56*	*72*
050.	Pittsburgh, University of	12	16	29	.08	5.0	1.00	.09
	Chemical and Petroleum Engineering	*49*	*49*	*52*	*38*	*62*	*67*	*44*
051.	Polytech Institute of New York	6	19	12	.20	7.3	.64	.00
	Chemical Engineering	*37*	*51*	*44*	*47*	*32*	*40*	*34*
052.	Princeton University	15	50	51	.21	5.1	.87	.06
	Chemical Engineering	*55*	*74*	*62*	*47*	*61*	*57*	*41*
053.	Purdue University-West Lafayette	21	44	70	.27	5.1	.82	.14
	Chemical Engineering	*67*	*70*	*71*	*51*	*61*	*53*	*50*
054.	Rensselaer Polytechnic Institute	20	5	15	NA	NA	NA	NA
	Chemical and Environmental Engineering	*65*	*40*	*46*				
055.	Rhode Island, University of	8	2	4	NA	NA	NA	NA
	Chemical Engineering	*41*	*38*	*41*				
056.	Rice University	13	18	28	.29	5.1	.95	.24
	Chemical Engineering	*51*	*50*	*52*	*53*	*61*	*63*	*60*
057.	Rochester, University of	10	14	18	.25	6.4	.93	.20
	Chemical Engineering	*45*	*47*	*47*	*50*	*44*	*62*	*56*
058.	Rutgers, The State University-New Brunswick	7	9	64	.08	6.4	.92	.08
	Chemical and Biochemical Engineering	*39*	*43*	*68*	*38*	*44*	*61*	*43*
059.	SUNY at Buffalo	13	24	18	.08	5.5	.67	.04
	Chemical Engineering	*51*	*55*	*47*	*38*	*56*	*42*	*39*
060.	SUNY-College of Environ Science & Forestry	9	5	9	NA	NA	NA	NA
	Paper Science and Engineering	*43*	*40*	*43*				

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TABLE 3.1 Program Measures (Raw and Standardized Values) in Chemical Engineering

Prog No.	Survey Results				University Library	Research Support		Published Articles		Survey Ratings Standard Error			
	(08)	(09)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(08)	(09)	(10)	(11)
041.	2.7	1.7	1.4	0.8	NA	.40	8416	8		.08	.06	.08	.07
	50	52	62	47		52	51	48	48				
042.	3.8	2.3	1.1	1.5	0.3	.55	5170	17		.07	.05	.06	.06
	62	63	52	64	51	61	47	59	57				
043.	3.2	1.9	1.5	1.3	-1.3	NA	1544	23		.08	.05	.07	.06
	56	56	67	59	35		43	66	61				
044.	2.6	1.7	1.1	0.8	0.9	.15	10926	8		.09	.06	.07	.06
	50	52	49	48	56	37	54	48	48				
045.	2.3	1.4	1.1	0.6	-1.9	NA	4120	3		.09	.08	.06	.06
	46	47	52	42	29		46	42	43				
046.	2.4	1.5	1.0	0.6	-0.6	.42	1834	4		.08	.07	.05	.06
	47	49	46	43	43	53	43	43	43				
047.	2.8	1.6	1.0	1.1	NA	NA	3128	7		.08	.07	.05	.07
	52	51	47	54			45	47	46				
048.	3.0	1.8	1.4	1.1	0.7	.31	22901	34		.08	.06	.06	.06
	53	53	61	55	55	46	67	79	70				
049.	3.9	2.2	1.4	1.5	0.7	.36	4579	18		.07	.05	.06	.06
	63	61	63	65	54	49	46	60	61				
050.	2.2	1.5	1.2	0.7	0.1	.25	2794	18		.09	.08	.07	.07
	45	48	53	45	49	43	44	60	61				
051.	1.8	1.2	0.6	0.6	NA	NA	5310	6		.11	.08	.09	.06
	41	42	30	42			47	45	45				
052.	4.0	2.3	0.6	1.5	0.9	.47	6358	13		.07	.05	.07	.06
	64	64	32	64	56	56	48	54	53				
053.	3.7	2.1	1.5	1.5	-0.5	.48	17331	34		.07	.05	.06	.06
	61	60	68	64	43	56	61	79	80				
054.	2.6	1.6	1.2	0.9	NA	.55	7849	13		.09	.08	.06	.06
	49	50	55	49		61	50	54	55				
055.	1.7	0.8	1.2	0.5	NA	NA	2611	1		.13	.10	.08	.05
	40	36	54	39			44	40	40				
056.	3.2	1.9	0.9	1.1	-1.4	.39	1782	11		.08	.05	.08	.07
	56	55	43	55	34	51	43	51	49				
057.	3.0	1.8	1.2	1.1	-0.6	.70	16764	3		.08	.06	.07	.07
	54	53	54	55	42	70	60	42	43				
058.	1.8	1.1	1.0	0.5	0.8	NA	1877	0		.10	.08	.07	.06
	41	41	45	40	56		43	38	39				
059.	3.1	1.7	1.0	1.2	0.3	.62	3019	15		.07	.05	.08	.06
	55	52	46	56	51	65	45	56	56				
060.	1.3	0.7	0.9	0.3	NA	NA	1745	0		.14	.10	.05	.05
	36	33	45	34			43	38	39				

NOTE: On the first line of data for every program, raw values for each measure are reported; on the second line values are reported in standardized form, with mean = 50 and standard deviation = 10. "NA" indicates that the value for a measure is not available. Since the scale used to compute measure 16 is entirely arbitrary, only values in standardized form are reported for this measure.

TABLE 3.1 Program Measures (Raw and Standardized Values) in Chemical Engineering

Prog No.	University - Department/Academic Unit	Program Size			Characteristics of Program Graduates			
		(01)	(02)	(03)	(04)	(05)	(06)	(07)
061.	Southern California, University of	8	5	12	NA	NA	NA	NA
	Chemical Engineering	*41*	*40*	*44*				
062.	Stanford University	9	32	51	.29	5.6	.86	.17
	Chemical Engineering	*43*	*61*	*62*	*53*	*54*	*57*	*53*
063.	Stevens Institute of Technology	9	11	10	.27	7.3	.55	.09
	Chemistry/Chemical Engineering	*43*	*45*	*43*	*52*	*32*	*32*	*44*
064.	Syracuse University	12	29	10	.14	7.1	.52	.17
	Chemical Engineering and Materials Science	*49*	*58*	*43*	*42*	*34*	*30*	*53*
065.	Tennessee, University of-Knoxville	25	19	15	.24	6.3	.77	.06
	Chemical, Metallurgical, & Polymer Engin	*75*	*51*	*46*	*49*	*46*	*49*	*41*
066.	Texas A & M University	14	15	15	.39	5.5	.69	.00
	Chemical Engineering	*53*	*48*	*46*	*60*	*56*	*43*	*34*
067.	Texas, University of-Austin	17	30	33	.18	5.9	.77	.12
	Chemical Engineering	*59*	*59*	*54*	*45*	*50*	*49*	*47*
068.	Tulane University	7	2	22	NA	NA	NA	NA
	Chemical Engineering	*39*	*38*	*49*				
069.	Tulsa, University of	8	5	9	NA	NA	NA	NA
	Chemical Engineering	*41*	*40*	*43*				
070.	Utah, University of-Salt Lake City	10	12	15	.82	5.8	.73	.09
	Chemical Engineering	*45*	*46*	*46*	*90*	*52*	*46*	*44*
071.	Vanderbilt University	9	6	2	NA	NA	NA	NA
	Chemical Engineering	*43*	*41*	*40*				
072.	Virginia, University of	10	9	13	NA	NA	.60	.40
	Chemical Engineering	*45*	*43*	*45*			*36*	*77*
073.	Washington University-Saint Louis	9	12	13	.47	7.0	.88	.18
	Chemical Engineering	*43*	*46*	*45*	*66*	*36*	*58*	*53*
074.	Washington, University of-Seattle	18	26	9	.27	6.2	.59	.09
	Chemical Engineering	*61*	*56*	*43*	*52*	*47*	*36*	*44*
075.	Wayne State University	17	15	7	.18	7.0	.73	.27
	Chemical Engineering	*59*	*48*	*42*	*45*	*36*	*46*	*64*
076.	West Virginia University	10	11	9	.18	5.3	.82	.27
	Chemical Engineering	*45*	*45*	*43*	*45*	*59*	*53*	*64*
077.	Wisconsin, University of-Madison	17	46	76	.36	5.0	.86	.24
	Chemical Engineering	*59*	*71*	*74*	*58*	*63*	*56*	*60*
078.	Worcester Polytechnic Institute	8	7	7	NA	NA	NA	NA
	Chemical Engineering	*41*	*42*	*42*				
079.	Yale University	10	13	18	.18	4.8	.64	.18
	Engineering and Applied Science	*45*	*46*	*47*	*45*	*64*	*39*	*54*

* indicates program was initiated since 1970.

NOTE: On the first line of data for every program, raw values for each measure are reported; on the second line values are reported in standardized form, with mean = 50 and standard deviation = 10. "NA" indicates that the value for a measure is not available.

TABLE 2.1 Program Measures (Raw and Standardized Values) in Chemical Engineering

Prog No.	Survey Results				University Library	Research Support		Published Articles		Survey Ratings Standard Error			
	(08)	(09)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(08)	(09)	(10)	(11)
061.	2.0	1.2	1.6	0.7	0.4	NA	18269	8		.10	.08	.05	.07
	43	*42*	*69*	*44*	*51*		*62*	*48*	*43*				
062.	4.5	2.7	1.0	1.6	2.0	NA	25196	7		.06	.05	.04	.05
	70	*70*	*48*	*67*	*67*		*70*	*47*	*42*				
063.	1.5	0.9	1.0	0.4	NA	NA	2313	4		.11	.08	.08	.06
	37	*36*	*46*	*38*			*44*	*43*	*43*				
064.	2.4	1.6	1.0	0.7	-0.3	.33	4063	7		.10	.07	.07	.06
	48	*49*	*46*	*44*	*45*	*48*	*46*	*47*	*47*				
065.	2.6	1.5	1.1	0.7	-0.4	.24	4266	8		.10	.08	.05	.06
	49	*49*	*49*	*45*	*44*	*42*	*46*	*48*	*48*				
066.	2.4	1.5	1.0	0.7	-0.5	.21	18988	17		.09	.07	.06	.06
	48	*47*	*48*	*45*	*43*	*40*	*63*	*59*	*50*				
067.	3.7	2.1	1.4	1.4	1.6	.29	10517	22		.08	.05	.05	.06
	61	*60*	*61*	*61*	*63*	*45*	*53*	*65*	*61*				
068.	1.6	0.9	0.6	0.6	-1.0	NA	NA	2		.12	.09	.07	.06
	38	*36*	*31*	*41*	*38*			*41*	*40*				
069.	1.7	1.1	1.2	0.5	NA	NA	NA	10		.09	.08	.08	.06
	40	*40*	*55*	*39*				*50*	*51*				
070.	2.5	1.6	1.1	0.7	-0.6	.30	7123	14		.10	.07	.05	.06
	48	*49*	*51*	*45*	*42*	*46*	*49*	*55*	*46*				
071.	1.6	1.1	0.9	0.4	-0.7	NA	NA	4		.12	.09	.07	.05
	39	*40*	*44*	*36*	*41*			*43*	*44*				
072.	2.5	1.6	1.5	1.1	0.7	.40	4673	3		.07	.06	.06	.07
	48	*50*	*66*	*55*	*55*	*52*	*46*	*42*	*44*				
073.	2.8	1.8	1.3	1.0	-0.4	NA	5257	12		.08	.06	.07	.06
	52	*54*	*58*	*51*	*44*		*47*	*53*	*55*				
074.	3.4	2.0	1.3	1.2	1.5	.56	5430	7		.07	.03	.06	.07
	58	*58*	*60*	*56*	*62*	*61*	*47*	*47*	*45*				
075.	1.7	1.1	1.1	0.4	-0.4	.18	2693	0		.11	.09	.09	.05
	40	*41*	*49*	*37*	*45*	*38*	*44*	*38*	*39*				
076.	2.3	1.5	1.2	0.7	NA	.50	4618	10		.09	.07	.07	.07
	47	*48*	*53*	*45*		*58*	*46*	*50*	*50*				
077.	4.8	2.8	1.0	1.8	1.6	.65	9919	19		.04	.04	.05	.04
	72	*72*	*45*	*71*	*63*	*67*	*52*	*61*	*61*				
078.	1.7	1.0	0.8	0.5	NA	NA	2509	6		.11	.09	.08	.07
	40	*40*	*38*	*41*			*44*	*45*	*48*				
079.	2.7	1.6	0.9	0.8	2.1	.60	2510	0		.11	.08	.06	.07
	50	*50*	*43*	*48*	*68*	*64*	*44*	*38*	*39*				

NOTE: On the first line of data for every program, raw values for each measure are reported; on the second line values are reported in standardized form, with mean = 50 and standard deviation = 10. "NA" indicates that the value for a measure is not available. Since the scale used to compute measure 16 is entirely arbitrary, only values in standardized form are reported for this measure.

TABLE 3.2 Summary Statistics Describing Each Program Measure--Chemical Engineering

Measure	Number of Programs Evaluated	Mean	Standard Deviation	DECILES								
				1	2	3	4	5	6	7	8	9
Program Size												
01 Raw Value	79	12	5	7	9	9	10	11	12	14	16	19
Std Value	79	50	10	39	43	43	45	47	49	53	57	63
02 Raw Value	79	18	13	5	6	9	11	14	16	22	27	33
Std Value	79	50	10	40	41	43	45	47	49	53	57	61
03 Raw Value	77	24	22	5	9	12	13	16	20	27	33	56
Std Value	77	50	10	41	43	44	45	46	48	51	54	65
Program Graduates												
04 Raw Value	56	.25	.14	.09	.14	.18	.20	.24	.26	.27	.30	.37
Std Value	56	50	10	39	42	45	46	49	51	51	54	59
05 Raw Value	55	5.9	.8	7.2	6.5	6.3	6.2	5.9	5.6	5.4	5.3	5.0
Std Value	55	50	10	34	43	45	47	50	54	57	58	62
06 Raw Value	57	.78	.13	.59	.65	.73	.77	.80	.82	.84	.87	.93
Std Value	57	50	10	35	40	46	49	52	53	55	57	62
07 Raw Value	57	.15	.09	.02	.06	.09	.10	.14	.16	.20	.22	.26
Std Value	57	50	10	36	40	43	44	49	51	56	58	62
Survey Results												
08 Raw Value	79	2.7	1.0	1.6	1.8	2.1	2.4	2.5	2.7	3.0	3.4	4.0
Std Value	79	50	10	39	41	44	47	48	50	54	58	64
09 Raw Value	79	1.6	.5	.9	1.1	1.3	1.5	1.6	1.7	1.8	2.0	2.3
Std Value	79	50	10	37	41	45	48	50	52	54	58	63
10 Raw Value	79	1.1	.3	.7	.9	.9	1.0	1.0	1.1	1.2	1.3	1.5
Std Value	79	50	10	35	43	43	47	47	51	55	58	66
11 Raw Value	79	.9	.4	.4	.5	.7	.7	.8	.9	1.1	1.3	1.5
Std Value	79	50	10	37	40	45	45	47	50	55	60	65
University Library												
12 Raw Value	52	.2	1.0	-1.0	-.6	-.5	-.4	-.1	.3	.8	1.3	1.8
Std Value	52	50	10	38	42	43	44	47	51	56	60	65
Research Support												
13 Raw Value	55	.37	.17	.18	.21	.28	.31	.34	.40	.45	.50	.60
Std Value	55	50	10	39	41	45	46	48	52	55	58	64
14 Raw Value	69	7819	8858	1830	2351	2764	4067	4599	5336	7993	10599	18340
Std Value	69	50	10	43	44	44	46	46	47	50	53	62
Publication Records												
15 Raw Value	79	10	8	1	3	4	6	8	9	11	15	22
Std Value	79	50	10	40	42	43	45	48	49	51	56	64
16 Std Value	79	50	10	40	42	43	46	48	49	52	56	61

NOTE: Standardized values reported in the preceding table have been computed from exact values of the mean and standard deviation and not the rounded values reported here. Since the scale used to compute measure 16 is entirely arbitrary, only data in standardized form are reported for this measure.

TABLE 3.3 Intercorrelations Among Program Measures on 79 Programs in Chemical Engineering

	Measure															
	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16
Program Size																
01		.53	.52	-.11	.20	.07	.09	.51	.49	.22	.46	.18	.01	.48	.42	.46
02			.82	.00	.32	.22	.14	.83	.83	.07	.79	.40	.45	.42	.66	.69
03				.07	.36	.31	.20	.77	.75	.11	.76	.42	.43	.50	.61	.65
Program Graduates																
04					.00	.09	.13	.20	.18	.00	.18	-.28	.17	-.02	.08	.07
05						.20	.10	.43	.44	.21	.44	.22	.31	.00	.30	.30
06							.24	.27	.20	.18	.21	-.12	.07	.07	.15	.23
07								.25	.23	.27	.28	-.04	.03	.02	.06	.14
Survey Results																
08									.99	.31	.96	.41	.62	.42	.65	.65
09										.29	.95	.40	.61	.41	.64	.63
10											.30	-.14	.01	.18	.36	.34
11												.39	.61	.41	.67	.68
University Library																
12													.31	.21	.11	.12
Research Support																
13														.09	.31	.35
14															.39	.35
Publication Records																
15																.96
16																

NOTE: Since in computing correlation coefficients program data must be available for both of the measures being correlated, the actual number of programs on which each coefficient is based varies.

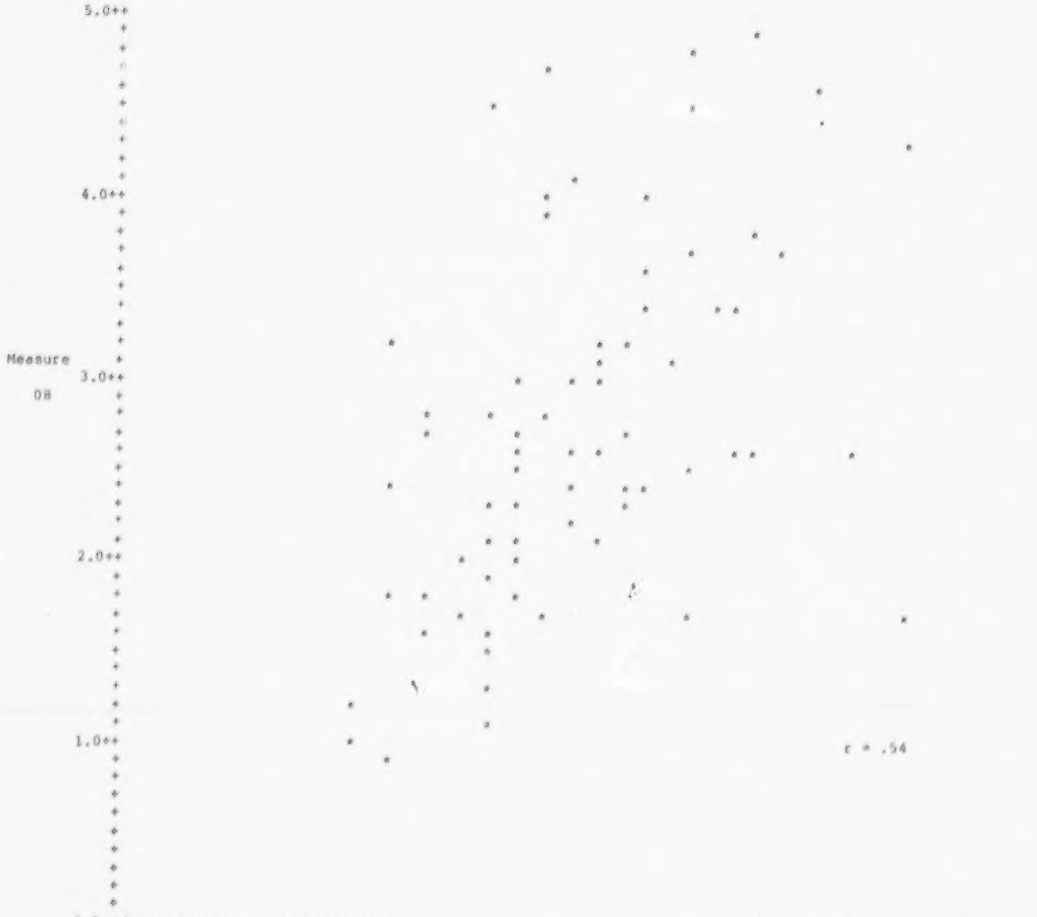

FIGURE 3.1 Mean rating of scholarly quality of faculty (measure 08) versus number of faculty members (measure 01)--79 programs in chemical engineering.

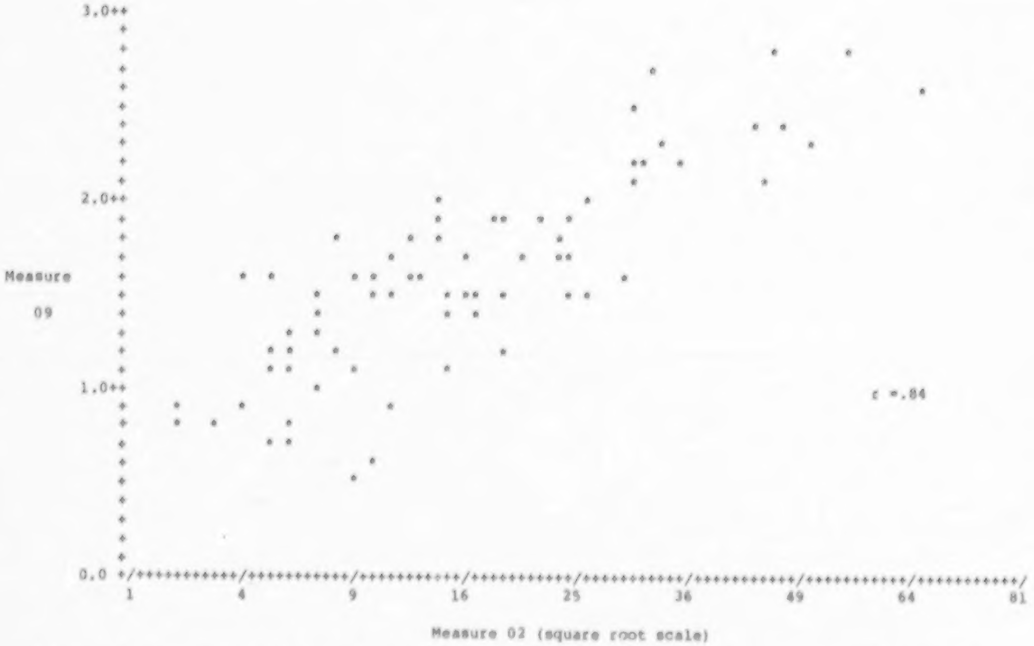

FIGURE 3.2 Mean rating of program effectiveness in educating research scholars/scientists (measure 09) versus number of graduates in last five years (measure 02)--79 programs in chemical engineering.

TABLE 3.4 Characteristics of Survey Participants in Chemical Engineering

	Respondents	
	N	%
Field of Specialization		
Chemical Engineering	159	97
Other/Unknown	5	3
Faculty Rank		
Professor	99	60
Associate Professor	35	21
Assistant Professor	30	18
Year of Highest Degree		
Pre-1950	6	4
1950-59	38	23
1960-69	59	36
Post-1969	61	37
Evaluator Selection		
Nominated by Institution	145	88
Other	19	12
Survey Form		
With Faculty Names	151	92
Without Names	13	8
Total Evaluators	164	100

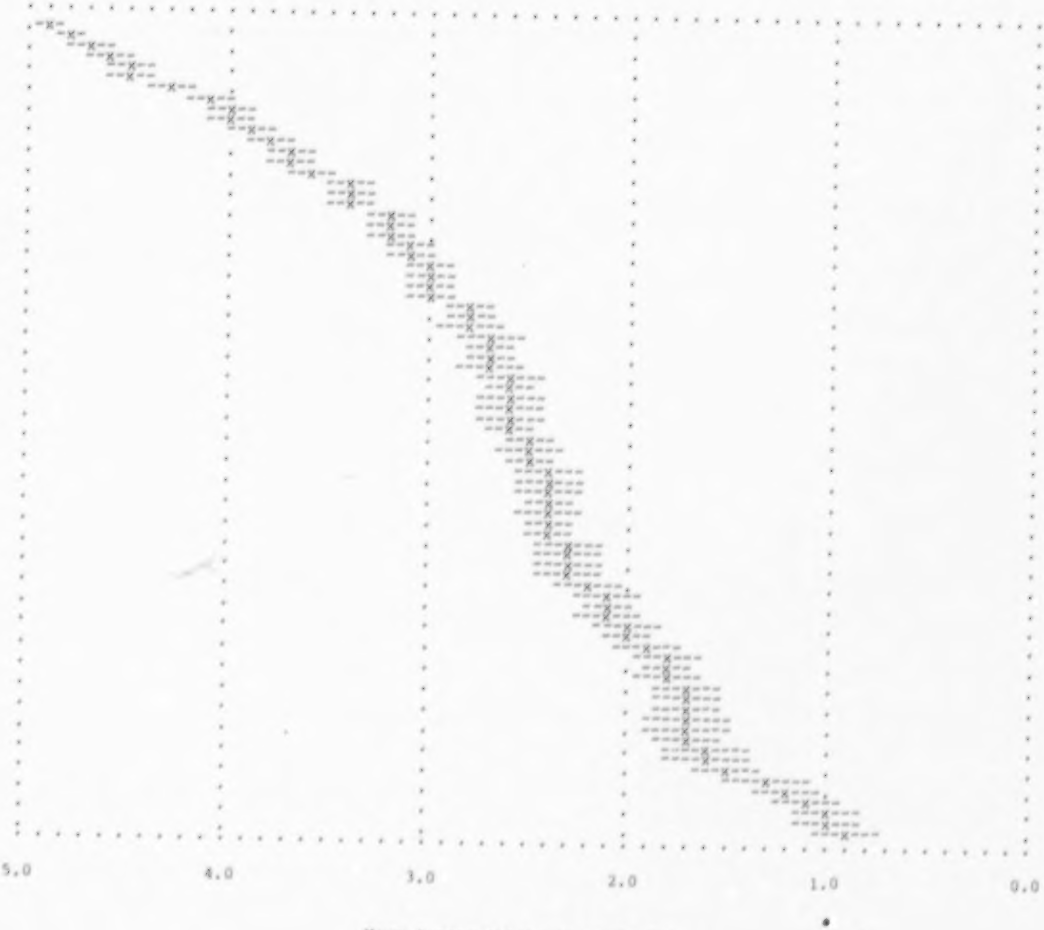

FIGURE 3.3 Mean rating of scholarly quality of faculty in 79 programs in chemical engineering.

NOTE: Programs are listed in sequence of mean rating, with the highest-rated program appearing at the top of the page. The broken lines (---) indicate a confidence interval of ±1.5 standard errors around the reported mean (x) of each program.

IV

Civil Engineering Programs

In this chapter 74 research-doctorate programs in civil engineering are assessed. These programs, according to the information supplied by their universities, have accounted for 1,583 doctoral degrees awarded during the FY1976-80 period--approximately 97 percent of the aggregate number of civil, sanitary, and environmental engineering doctorates earned from U.S. universities in this five-year span.[1] On the average, 35 full-time and part-time students intending to earn doctorates were enrolled in a program in December 1980, with an average faculty size of 20 members.[2] Only 5 of the programs were initiated since 1970, and only one institution--Vanderbilt University--had two civil engineering programs included in the assessment. In addition to the 73 institutions represented in this discipline, another 2 were initially identified as meeting the criteria[3] for inclusion in the assessment:

Harvard University
University of North Carolina--
Chapel Hill

Civil engineering programs at these two institutions have not been included in the evaluations in this discipline, since in each case the study coordinator either indicated that the institution did not at that time have a research-doctorate program in civil engineering or failed to provide the information requested by the committee.

Before examining individual program results presented in Table 4.1, the reader is urged to refer to Chapter II, in which each of the 16 measures used in the assessment is discussed. Summary statistics describing every measure are given in Table 4.2. For 10 of the measures, data are reported for at least 67 of the 74 civil engineering programs. For measures 04-07, which pertain to characteristics of the program graduates, data are presented for only approximately three-fifths of the programs; the other two-fifths had too few graduates on which to base statistics.[4] For measure 12, a composite index of the size of a university library, data are available for 56 programs; for measure 13, the fraction of faculty members with research support from the National Science Foundation, the National Institutes of Health, and the Alcohol, Drug Abuse and Mental Health Administration, data are reported for 61 programs that had at least 10 faculty members. The programs not evaluated on measures 12 and 13 are typically smaller--in terms of faculty size and graduate student enrollment--than other civil engineering programs. Were data on these two measures available for all 74 programs, it is likely that their reported means would be appreciably lower (and that some of the correlations of these measures with others would be higher).

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[1] Data from the NRC's Survey of Earned Doctorates indicate that 1,293 research doctorates in civil engineering and another 341 research doctorates in sanitary and environmental engineering were awarded by U.S. universities between FY1976 and FY1980.

[2] See the reported means for measures 03 and 01 in Table 4.2.

[3] As mentioned in Chapter I, the primary criterion for inclusion was that a university had awarded 6 or more doctorates in civil engineering during the FY1976-78 period.

Intercorrelations among the 16 measures (Pearson product-moment coefficients) are given in Table 4.3. Of particular note are the high positive correlations of the measures of faculty size (01) and numbers of recent program graduates (02) with measures of publication records (15, 16) and reputational survey ratings (08, 09). Figure 4.1 illustrates the relation between the mean rating of the scholarly quality of faculty (measure 08) and the number of faculty members (measure 01) for each of 74 programs in civil engineering. Figure 4.2 plots the mean rating of program effectiveness (measure 09) against the total number of FY1976-80 program graduates (measure 02). Although in both figures there is a significant positive correlation between program size and reputational rating, it is quite apparent that some of the smaller programs received high mean ratings and that some of the larger programs received low mean ratings.

Table 4.4 describes the 129 faculty members who participated in the evaluation of civil engineering programs. These individuals constituted 58 percent of those asked to respond to the survey in this discipline and 9 percent of the faculty population in the 74 research-doctorate programs being evaluated.[5] Approximately one-fourth of the survey participants had earned their highest degree since 1970, and a majority held the rank of full professor.

To assist the reader in interpreting results of the survey evaluations, estimated standard errors have been computed for mean ratings of the scholarly quality of faculty in 74 civil engineering programs (and are given in Table 4.1). For each program the mean rating and an associated "confidence interval" of 1.5 standard errors are illustrated in Figure 4.3 (listed in order of highest to lowest mean rating). In comparing two programs, if their confidence intervals do not overlap, one may conclude that there is a significant difference in their mean ratings, at a .05 level of significance.[6] From this figure it is also apparent that one should have somewhat more confidence in the accuracy of the mean ratings of higher-rated programs than lower-rated programs. This generalization results primarily from the fact that evaluators are not as likely to be familiar with the less prestigious programs, and consequently the mean ratings of these programs are usually based on fewer survey responses.

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[4] As mentioned in Chapter II, data for measures 04-07 are not reported if they are based on the survey responses of fewer than 10 FY1975-79 program graduates.

[5] See Table 2.3 in Chapter II.

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[6] See pp. 29-31 for a discussion of the interpretation of mean ratings and associated confidence intervals.

TABLE 4.1 Program Measures (Raw and Standardized Values) in Civil Engineering

Prog No.	University - Department/Academic Unit	Program Size (01)	(02)	(03)	Characteristics of Program Graduates (04)	(05)	(06)	(07)
001.	Arizona, University of-Tucson	14	7	15	NA	NA	NA	NA
	Civil Engineering	*45*	*44*	*45*				
002.	Brown University	8	9	12	NA	NA	NA	NA
	Engineering	*41*	*45*	*44*				
003.	California Institute of Technology	8	10	30	.18	NA	.82	.27
	Engineering and Applied Science	*41*	*45*	*49*	*57*		*62*	*57*
004.	California, University of-Berkeley	57	161	187	.13	7.2	.72	.18
	Civil Engineering	*79*	*99*	*91*	*50*	*47*	*52*	*48*
005.	California, University of-Davis	25	21	141	.10	6.3	.65	.25
	Civil Engineering	*54*	*50*	*78*	*46*	*56*	*46*	*55*
006.	California, University of-Los Angeles	22	36	82	.04	7.9	.73	.19
	Engineering and Applied Science	*52*	*56*	*63*	*38*	*41*	*53*	*50*
007.	Carnegie-Mellon University	19	12	15	NA	NA	NA	NA
	Civil Engineering	*49*	*46*	*45*				
008.	Cincinnati, University of	14	4	15	NA	NA	NA	NA
	Civil and Environmental Engineering	*45*	*43*	*45*				
009.	Clemson University	13	2	8	NA	NA	NA	NA
	Civil Engineering	*45*	*42*	*43*				
010.	Colorado State University-Fort Collins	49	80	76	.09	6.9	.68	.18
	Civil Engineering	*73*	*73*	*61*	*44*	*50*	*48*	*49*
011.	Colorado, University of	23	15	85	.05	7.2	.83	.44
	Civil Engineering	*53*	*47*	*63*	*40*	*47*	*63*	*73*
012.	Columbia University	10	24	25	.11	5.5	.50	.17
	Civil Engineering and Engineering Mechanics	*42*	*51*	*47*	*47*	*64*	*32*	*47*
013.	Connecticut, University of-Storrs	18	9	11	.08	7.5	.91	.27
	Civil Engineering	*49*	*45*	*44*	*44*	*44*	*70*	*57*
014.	Cornell University-Ithaca	32	47	73	.23	6.9	.82	.21
	Civil and Environmental Engineering	*60*	*60*	*60*	*62*	*51*	*61*	*51*
015.	Drexel University	14	1	20	NA	NA	NA	NA
	*Civil Engineering**	*45*	*42*	*46*				
016.	Duke University	11	6	29	NA	NA	NA	NA
	Civil Engineering	*43*	*44*	*48*				
017.	Florida, University of-Gainesville	16	18	177	.22	7.8	.58	.13
	Civil Engineering	*47*	*49*	*88*	*61*	*41*	*40*	*44*
018.	Georgia Institute of Technology	31	15	21	.15	9.0	.77	.15
	Civil Engineering	*59*	*47*	*46*	*53*	*30*	*57*	*46*
019.	Houston, University of	13	17	17	NA	NA	NA	NA
	Civil Engineering	*45*	*48*	*45*				
020.	Illinois Institute of Technology	7	9	10	.00	6.5	.58	.08
	Civil Engineering	*40*	*45*	*43*	*33*	*54*	*40*	*40*

* indicates program was initiated since 1970.

NOTE: On the first line of data for every program, raw values for each measure are reported; on the second line values are reported in standardized form, with mean = 50 and standard deviation = 10. "NA" indicates that the value for a measure is not available.

TABLE 4.1 Program Measures (Raw and Standardized Values) in Civil Engineering

Prog No.	Survey Results				University Library	Research Support		Published Articles		Survey Ratings Standard Error			
	(08)	(09)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(08)	(09)	(10)	(11)
001.	2.2	1.3	1.1	0.6	0.9	.07	5261	22		.13	.10	.11	.06
	44	*43*	*55*	*45*	*57*	*41*	*47*	*60*	*54*				
002.	3.3	2.0	0.7	0.7	-1.1	NA	3497	0		.18	.10	.10	.08
	58	*59*	*37*	*48*	*38*		*45*	*38*	*38*				
003.	4.5	2.6	1.0	1.3	NA	NA	8339	10		.08	.06	.04	.08
	71	*71*	*49*	*66*			*50*	*48*	*53*				
004.	4.8	2.7	1.0	1.7	2.2	.40	16448	38		.05	.05	.07	.05
	75	*74*	*51*	*79*	*70*	*64*	*60*	*76*	*75*				
005.	3.1	1.8	1.4	0.9	0.6	.32	3136	13		.10	.06	.08	.07
	55	*55*	*68*	*55*	*55*	*58*	*44*	*51*	*51*				
006.	3.3	1.9	1.0	1.0	2.0	.55	6168	8		.11	.06	.08	.08
	58	*57*	*51*	*58*	*68*	*74*	*48*	*46*	*46*				
007.	3.3	1.8	1.2	1.1	NA	.26	6409	4		.09	.06	.08	.07
	57	*55*	*59*	*60*		*54*	*48*	*42*	*43*				
008.	1.6	1.0	1.1	0.3	-0.2	.00	2360	1		.16	.12	.13	.06
	38	*39*	*54*	*38*	*46*	*36*	*44*	*39*	*40*				
009.	2.0	1.0	1.0	0.5	NA	.31	4356	8		.16	.13	.12	.06
	42	*38*	*49*	*43*		*57*	*46*	*46*	*48*				
010.	3.6	2.1	1.2	1.0	-1.1	.20	8604	53		.10	.06	.08	.07
	61	*62*	*59*	*59*	*37*	*50*	*51*	*91*	*82*				
011.	2.9	1.7	1.2	0.9	-0.9	.35	1849	8		.10	.06	.08	.07
	53	*54*	*56*	*53*	*40*	*60*	*43*	*46*	*48*				
012.	3.3	2.0	0.7	0.7	1.7	.40	5375	1		.14	.08	.09	.08
	57	*59*	*38*	*49*	*66*	*64*	*47*	*39*	*38*				
013.	1.9	1.1	0.9	0.5	-0.5	.06	4069	10		.12	.11	.12	.07
	41	*40*	*46*	*42*	*43*	*40*	*46*	*48*	*47*				
014.	4.1	2.4	1.3	1.5	1.6	.38	13206	33		.09	.06	.07	.07
	66	*66*	*60*	*71*	*64*	*62*	*56*	*71*	*71*				
015.	2.0	1.0	1.2	0.6	NA	.14	2649	8		.17	.13	.12	.07
	42	*39*	*57*	*46*		*46*	*44*	*46*	*49*				
016.	2.6	1.5	1.0	0.7	0.3	.18	NA	2		.12	.08	.11	.07
	50	*49*	*49*	*49*	*52*	*49*		*40*	*41*				
017.	2.3	1.4	0.9	0.4	0.8	.06	13686	16		.12	.11	.15	.07
	45	*47*	*44*	*41*	*56*	*40*	*56*	*54*	*55*				
018.	3.3	1.9	1.3	1.0	NA	.29	29270	18		.09	.05	.09	.07
	57	*56*	*61*	*57*		*56*	*74*	*56*	*60*				
019.	2.1	1.2	1.4	0.5	-0.9	.15	5015	6		.15	.12	.11	.07
	43	*42*	*66*	*44*	*39*	*47*	*47*	*44*	*44*				
020.	1.7	1.1	0.4	0.6	NA	NA	NA	5		.16	.11	.10	.07
	39	*39*	*24*	*47*				*43*	*45*				

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TABLE 4.1 Program Measures (Raw and Standardized Values) in Civil Engineering

		Program Size			Characteristics of Program Graduates			
Prog No.	University - Department/Academic Unit	(01)	(02)	(03)	(04)	(05)	(06)	(07)
021.	Illinois, University-Urbana/Champaign	67	79	130	.10	6.7	.72	.32
	Civil Engineering	*87*	*73*	*75*	*46*	*52*	*53*	*61*
022.	Iowa State University-Ames	19	15	24	NA	5.9	.90	.10
	Civil Engineering	*49*	*47*	*47*		*60*	*69*	*41*
023.	Iowa, University of-Iowa City	19	17	26	.00	6.7	.75	.31
	Civil and Environmental Engineering	*49*	*48*	*48*	*33*	*53*	*55*	*61*
024.	Johns Hopkins University	5	NA	2	NA	NA	NA	NA
	Civil Engineering	*38*		*41*				
025.	Kansas, University of	23	16	22	NA	NA	NA	NA
	Civil Engineering	*53*	*48*	*47*				
026.	Lehigh University	19	8	11	NA	NA	NA	NA
	Civil Engineering	*49*	*45*	*44*				
027.	Maryland, University of-College Park	19	10	35	.10	6.2	.70	.10
	Civil Engineering	*49*	*45*	*50*	*46*	*58*	*51*	*41*
028.	Massachusetts Institute of Technology	53	85	91	.20	5.1	.60	.29
	Civil Engineering	*76*	*75*	*65*	*59*	*68*	*41*	*58*
029.	Massachusetts, University of-Amherst	19	21	16	.19	8.5	.75	.20
	Civil Engineering	*49*	*50*	*45*	*58*	*34*	*55*	*50*
030.	Michigan State University-East Lansing	17	13	15	.20	6.5	NA	NA
	Civil and Sanitary Engineering	*48*	*47*	*45*	*59*	*54*		
031.	Michigan, University of-Ann Arbor	23	24	39	.26	7.0	.63	.11
	Civil Engineering	*53*	*51*	*51*	*67*	*49*	*44*	*42*
032.	Minnesota, University of	17	12	22	.15	7.2	.69	.23
	Civil and Mineral Engineering	*48*	*46*	*47*	*53*	*48*	*50*	*53*
033.	Missouri, University of-Columbia	9	12	8	NA	NA	NA	NA
	Civil Engineering	*42*	*46*	*43*				
034.	Missouri, University of-Rolla	21	17	21	.11	7.5	.67	.22
	Civil Engineering	*51*	*48*	*46*	*47*	*44*	*48*	*52*
035.	New Jersey Institute of Technology	25	4	NA	NA	NA	NA	NA
	*Civil and Environmental Engineering**	*54*	*43*					
036.	New Mexico, University of-Albuquerque	16	6	13	NA	NA	NA	NA
	Civil Engineering	*47*	*44*	*44*				
037.	North Carolina State University-Raleigh	30	20	28	.21	7.8	.86	.09
	Civil Engineering	*58*	*49*	*48*	*60*	*42*	*66*	*40*
038.	Northwestern University	30	51	29	.23	5.9	.55	.14
	Civil Engineering	*58*	*62*	*48*	*62*	*60*	*37*	*45*
039.	Notre Dame, University of	7	10	6	.29	6.6	.62	.31
	Civil Engineering	*40*	*45*	*42*	*70*	*53*	*43*	*60*
040.	Ohio State University-Columbus	14	24	55	.00	6.1	.48	.04
	Civil Engineering	*45*	*51*	*55*	*33*	*58*	*30*	*36*

* indicates program was initiated since 1970.

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TABLE 4.1 Program Measures (Raw and Standardized Values) in Civil Engineering

Prog No.	Survey Results				University Library	Research Support		Published Articles		Survey Ratings Standard Error			
	(08)	(09)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(08)	(09)	(10)	(11)
021.	4.5	2.6	0.9	1.5	2.0	.30	18980	33		.07	.05	.07	.06
	72	72	44	73	68	57	62	71	70				
022.	2.7	1.6	0.9	0.8	-0.5	.11	8330	21		.13	.08	.07	.07
	51	51	45	51	43	43	50	59	57				
023.	2.7	1.7	0.9	0.6	0.3	.21	2117	10		.13	.09	.09	.07
	50	52	43	47	51	51	43	48	46				
024.	1.4	0.8	0.7	0.4	-0.4	NA	1741	4		.28	.19	.15	.07
	35	33	34	39	44		43	42	42				
025.	2.7	1.5	1.3	0.7	0.1	.09	1707	3		.14	.10	.09	.07
	50	49	63	50	49	42	43	41	40				
026.	3.4	1.9	0.9	1.1	NA	.16	4568	3		.11	.07	.07	.08
	59	57	45	60		47	46	41	38				
027.	2.3	1.5	1.1	0.7	0.2	.16	3519	14		.12	.08	.10	.06
	46	48	54	47	50	47	45	52	56				
028.	4.7	2.6	0.9	1.6	-0.3	.38	59143	31		.07	.07	.07	.06
	74	72	46	76	45	62	99	69	58				
029.	2.7	1.7	1.3	0.8	-0.7	.26	2256	16		.11	.07	.09	.07
	50	52	63	51	41	54	43	54	53				
030.	2.4	1.5	0.8	0.6	0.3	.29	2247	9		.13	.11	.15	.07
	47	48	39	46	52	56	43	47	51				
031.	3.7	2.1	0.9	1.2	1.8	.35	19835	12		.09	.06	.07	.08
	61	62	44	62	66	60	63	50	50				
032.	2.7	1.6	0.9	0.7	1.2	.29	8726	10		.13	.09	.10	.07
	51	50	47	49	60	56	51	48	48				
033.	2.2	1.4	1.0	0.5	-0.2	NA	1976	8		.14	.09	.11	.07
	45	47	48	43	46		43	46	47				
034.	2.3	1.5	1.0	0.7	NA	.14	3606	8		.13	.09	.08	.07
	46	48	48	48		46	45	46	48				
035.	1.5	0.9	NA	0.3	NA	.08	NA	0		.20	.12	NA	.06
	37	35		36		41		38	38				
036.	2.2	1.3	1.0	0.5	-1.0	.06	6575	3		.13	.09	.11	.07
	45	43	49	44	39	40	48	41	41				
037.	3.0	1.7	1.1	0.8	NA	.10	8416	14		.10	.09	.07	.07
	54	52	52	51		43	50	52	51				
038.	3.9	2.3	1.1	1.3	0.3	.47	5170	26		.11	.07	.08	.07
	64	65	54	65	51	68	47	64	69				
039.	1.9	1.2	0.7	0.5	-1.3	NA	1544	10		.17	.10	.13	.07
	41	42	36	44	35		43	48	51				
040.	2.7	1.7	0.8	0.7	0.9	.21	10926	10		.11	.07	.09	.06
	51	52	39	48	57	51	53	48	53				

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TABLE 4.1 Program Measures (Raw and Standardized Values) in Civil Engineering

Prog No.	University - Department/Academic Unit	Program Size (01)	Program Size (02)	Program Size (03)	Characteristics of Program Graduates (04)	Characteristics of Program Graduates (05)	Characteristics of Program Graduates (06)	Characteristics of Program Graduates (07)
041.	Oklahoma State University-Stillwater	18	34	26	.03	7.0	.57	.14
	Civil Engineering	*49*	*55*	*48*	*36*	*49*	*39*	*45*
042.	Oklahoma, University of-Norman	15	28	16	.15	6.3	.50	.00
	Civil Engineering and Environmental Science	*46*	*53*	*45*	*53*	*57*	*32*	*32*
043.	Oregon State University-Corvallis	20	7	20	NA	NA	NA	NA
	Civil Engineering	*50*	*44*	*46*				
044.	Pennsylvania State University	15	17	18	.09	9.0	.73	.46
	Civil Engineering	*46*	*48*	*46*	*45*	*30*	*53*	*74*
045.	Pennsylvania, University of	10	6	9	NA	NA	NA	NA
	Civil and Urban Engineering	*42*	*44*	*43*				
046.	Pittsburgh, University of	17	20	38	.08	6.1	.62	.08
	Civil Engineering	*48*	*49*	*51*	*43*	*58*	*43*	*39*
047.	Polytech Institute of New York	9	6	22	NA	NA	NA	NA
	Civil and Environmental Engineering	*42*	*44*	*47*				
048.	Princeton University	20	15	38	.13	5.3	.60	.20
	Civil Engineering	*50*	*47*	*51*	*49*	*66*	*41*	*50*
049.	Purdue University-West Lafayette	54	69	84	.09	6.4	.70	.22
	Civil Engineering	*77*	*69*	*63*	*44*	*56*	*50*	*52*
050.	Rensselaer Polytechnic Institute	14	6	25	NA	NA	NA	NA
	Civil Engineering	*45*	*44*	*47*				
051.	Rhode Island, University of	9	2	4	NA	NA	NA	NA
	*Civil and Environmental Engineering**	*42*	*42*	*42*				
052.	Rice University	6	4	9	NA	NA	NA	NA
	Civil Engineering	*39*	*43*	*43*				
053.	Rutgers, The State University-New Brunswick	13	12	67	.17	9.3	.59	.00
	Civil and Environmental Engineering	*45*	*46*	*59*	*55*	*26*	*40*	*32*
054.	SUNY at Buffalo	15	12	32	NA	NA	NA	NA
	Civil Engineering	*46*	*46*	*49*				
055.	Southern California, University of	16	19	32	.14	9.2	.67	.08
	Civil Engineering	*47*	*49*	*49*	*52*	*28*	*48*	*40*
056.	Stanford University	24	58	60	.12	6.4	.74	.29
	Civil Engineering	*53*	*65*	*57*	*48*	*55*	*54*	*58*
057.	Syracuse University	11	7	8	NA	NA	NA	NA
	Civil Engineering	*43*	*44*	*43*				
058.	Tennessee, University of-Knoxville	13	14	16	.07	5.5	.79	.36
	*Civil Engineering**	*45*	*47*	*45*	*42*	*64*	*59*	*65*
059.	Texas A & M University	39	29	35	.10	8.0	.73	.40
	Civil Engineering	*65*	*53*	*50*	*46*	*39*	*54*	*69*
060.	Texas Tech University-Lubbock	11	10	6	NA	NA	NA	NA
	Civil Engineering	*43*	*45*	*42*				

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TABLE 4.1 Program Measures (Raw and Standardized Values) in Civil Engineering

Prog No.	Survey Results				University Library	Research Support		Published Articles		Survey Ratings Standard Error			
	(08)	(09)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(08)	(09)	(10)	(11)
041.	2.3	1.4	0.9	0.6	-1.9	.00	4120	7		.15	.10	.11	.07
	45	47	47	44	29	36	46	45	47				
042.	2.1	1.4	0.8	0.4	-0.6	.00	1834	5		.13	.10	.09	.06
	43	46	39	41	43	36	43	43	38				
043.	2.5	1.5	1.2	0.6	NA	.30	3128	16		.11	.09	.10	.07
	48	49	59	47		57	44	54	54				
044.	2.5	1.6	0.8	0.7	0.7	.07	22901	17		.13	.09	.10	.07
	48	50	40	50	55	41	67	55	57				
045.	2.4	1.5	0.9	0.6	0.7	.20	4579	5		.18	.10	.10	.07
	46	48	44	45	55	50	46	43	42				
046.	2.3	1.3	0.9	0.5	0.1	.24	2794	6		.14	.10	.11	.06
	46	45	45	43	49	52	44	44	45				
047.	1.7	1.2	0.6	0.3	NA	NA	5310	6		.17	.11	.10	.05
	39	43	34	38			47	44	47				
048.	3.6	2.1	1.3	1.1	0.9	.45	6358	10		.09	.06	.08	.07
	61	60	60	62	57	67	48	48	44				
049.	3.9	2.2	1.1	1.4	-0.5	.20	17331	23		.10	.07	.07	.07
	64	63	54	68	43	50	61	61	66				
050.	2.8	1.6	1.4	0.9	NA	.29	7849	9		.12	.07	.11	.08
	51	50	67	53		56	50	47	51				
051.	1.5	0.8	NA	0.3	NA	NA	2611	5		.18	.17	NA	.06
	36	35		38			44	43	43				
052.	2.8	1.5	0.8	0.7	-1.4	NA	1782	5		.16	.09	.07	.08
	52	49	42	49	34		43	43	42				
053.	1.9	1.1	0.8	0.5	0.8	.00	1877	13		.13	.08	.08	.06
	41	41	42	43	56	36	43	51	51				
054.	2.3	1.4	0.9	0.6	0.3	.13	3019	14		.12	.09	.11	.07
	46	46	46	46	51	45	44	52	51				
055.	2.7	1.5	1.1	0.6	0.4	.31	18269	9		.12	.08	.09	.07
	50	49	52	47	52	58	62	47	50				
056.	4.1	2.5	1.1	1.4	2.0	.58	25196	17		.09	.06	.07	.07
	67	70	52	69	68	77	70	55	53				
057.	1.9	1.2	1.0	0.4	-0.3	.36	4063	7		.16	.10	.13	.06
	40	43	49	40	45	61	46	45	47				
058.	2.2	1.3	1.2	0.5	-0.4	.00	4266	4		.13	.09	.11	.06
	44	45	57	42	44	36	46	42	41				
059.	3.2	1.8	1.2	0.8	-0.5	.03	18988	7		.10	.08	.09	.07
	56	55	59	53	44	38	62	45	45				
060.	1.7	1.0	1.1	0.4	NA	.18	5513	5		.15	.12	.09	.07
	39	37	53	40		49	47	43	46				

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TABLE 4.1 Program Measures (Raw and Standardized Values) in Civil Engineering

Prog No.	University - Department/Academic Unit	Program Size			Characteristics of Program Graduates			
		(01)	(02)	(03)	(04)	(05)	(06)	(07)
061.	Texas, University of-Arlington	14	6	28	NA	NA	NA	NA
	*Civil Engineering**	*45*	*44*	*48*				
062.	Texas, University of-Austin	42	62	69	.09	6.4	.56	.13
	Civil Engineering	*67*	*66*	*59*	*45*	*56*	*37*	*44*
063.	Tulane University	8	2	3	NA	NA	NA	NA
	Civil Engineering	*41*	*42*	*42*				
064.	Utah State University-Logan	20	21	30	.21	7.5	.74	.21
	Civil and Environmental Engineering	*50*	*50*	*49*	*60*	*44*	*54*	*51*
065.	Utah, University of-Salt Lake City	10	13	11	.00	7.5	NA	NA
	Civil Engineering	*42*	*47*	*44*	*33*	*44*		
066.	Vanderbilt University	5	6	2	NA	NA	NA	NA
	Civil and Environmental Engineering	*38*	*44*	*41*				
067.	Vanderbilt University	10	12	18	.27	7.0	.91	.27
	Environmental and Water Resources Engin	*42*	*46*	*46*	*69*	*49*	*70*	*57*
068.	Virginia Polytechnic Institute & State Univ	29	17	15	.05	6.4	.72	.22
	Civil Engineering	*57*	*48*	*45*	*40*	*55*	*53*	*52*
069.	Virginia, University of	15	10	14	NA	NA	NA	NA
	Civil Engineering	*46*	*45*	*44*				
070.	Washington University-Saint Louis	7	13	8	.08	5.5	.67	.17
	Civil Engineering	*40*	*47*	*43*	*44*	*64*	*48*	*47*
071.	Washington, University of-Seattle	42	43	41	.15	6.8	.75	.11
	Civil Engineering	*67*	*59*	*52*	*53*	*52*	*55*	*42*
072.	Wayne State University	9	8	7	NA	NA	NA	NA
	Civil Engineering	*42*	*45*	*43*				
073.	West Virginia University	16	11	NA	.21	7.5	.71	.00
	Civil Engineering	*47*	*46*		*61*	*44*	*52*	*32*
074.	Wisconsin, University of-Madison	29	37	43	.24	6.7	.75	.25
	Civil and Environmental Engineering	*57*	*56*	*52*	*64*	*53*	*55*	*55*

* indicates program was initiated since 1970.

NOTE: On the first line of data for every program, raw values for each measure are reported; on the second line values are reported in standardized form, with mean = 50 and standard deviation = 10. "NA" indicates that the value for a measure is not available.

TABLE 4.1 Program Measures (Raw and Standardized Values) in Civil Engineering

Prog No.	Survey Results				University Library	Research Support		Published Articles		Survey Ratings Standard Error			
	(08)	(09)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(08)	(09)	(10)	(11)
061.	1.6	1.0	1.0	0.4	NA	.00	NA	0		.22	.13	.10	.06
	37	38	51	39		36		38	38				
062.	4.2	2.3	1.7	1.5	1.6	.26	10517	27		.08	.05	.06	.06
	67	65	80	71	64	54	53	65	66				
063.	1.5	0.8	0.9	0.4	-1.0	NA	NA	1		.14	.08	.08	.06
	36	35	46	40	38			39	40				
064.	2.7	1.7	1.2	0.4	NA	.00	5513	27		.14	.10	.14	.07
	50	53	57	41		36	47	65	71				
065.	1.7	1.2	1.1	0.3	-0.6	.10	7123	0		.17	.11	.19	.06
	39	43	52	38	42	43	49	38	38				
066.	1.4	0.8	0.5	0.5	-0.7	NA	NA	6		.17	.11	.10	.07
	36	34	29	43	41			44	44				
067.	2.4	1.5	0.7	0.5	-0.7	.00	NA	6		.20	.13	.11	.08
	47	48	35	43	41	36		44	44				
068.	2.8	1.6	1.4	0.8	-0.0	.17	7243	29		.10	.07	.09	.06
	52	50	65	51	48	48	49	67	77				
069.	2.4	1.1	1.1	0.5	0.7	.07	4673	10		.12	.10	.12	.07
	47	40	55	43	56	41	46	48	46				
070.	2.7	1.6	0.9	0.9	-0.4	NA	5257	7		.13	.08	.08	.07
	50	51	44	56	44		47	45	38				
071.	3.6	2.0	1.4	1.1	1.5	.19	5430	13		.09	.05	.10	.08
	61	60	66	60	63	49	47	51	51				
072.	1.1	0.8	0.7	0.4	-0.4	NA	2693	1		.16	.12	.16	.07
	32	34	35	41	45		44	39	39				
073.	2.2	1.3	1.2	0.6	NA	.25	4618	13		.13	.10	.09	.06
	44	44	57	45		53	46	51	48				
074.	3.4	2.0	1.1	0.9	1.6	.17	9919	21		.08	.04	.08	.07
	59	59	54	53	64	48	52	59	59				

NOTE: On the first line of data for every program, raw values for each measure are reported; on the second line values are reported in standardized form, with mean = 50 and standard deviation = 10. "NA" indicates that the value for a measure is not available. Since the scale used to compute measure 16 is entirely arbitrary, only values in standardized form are reported for this measure.

TABLE 4.2 Summary Statistics Describing Each Program Measure--Civil Engineering

Measure	Number of Programs Evaluated	Mean	Standard Deviation	DECILES								
				1	2	3	4	5	6	7	8	9
Program Size												
01 Raw Value	74	20	13	8	10	13	14	16	19	20	25	36
Std Value	74	50	10	41	42	45	46	47	49	50	54	63
02 Raw Value	73	22	25	5	7	9	12	13	17	20	26	50
Std Value	73	50	10	43	44	45	46	47	48	49	52	61
03 Raw Value	72	35	37	7	10	15	17	22	26	32	42	81
Std Value	72	50	10	43	43	45	45	47	48	49	52	62
Program Graduates												
04 Raw Value	45	.13	.08	.01	.07	.09	.10	.11	.15	.18	.21	.23
Std Value	45	50	10	35	43	45	46	48	53	56	60	63
05 Raw Value	45	6.9	1.0	8.8	7.8	7.5	7.0	6.8	6.6	6.4	6.2	5.7
Std Value	45	50	10	31	41	44	49	51	53	55	57	62
06 Raw Value	44	.69	.11	.55	.58	.62	.67	.70	.73	.74	.75	.83
Std Value	44	50	10	37	40	44	48	51	54	55	55	63
07 Raw Value	44	.19	.11	.06	.10	.13	.16	.19	.21	.25	.28	.32
Std Value	44	50	10	38	42	45	47	50	52	55	58	62
Survey Results												
08 Raw Value	74	2.7	.9	1.6	1.9	2.2	2.3	2.5	2.7	3.0	3.3	3.9
Std Value	74	50	10	38	41	45	46	48	50	54	57	64
09 Raw Value	74	1.6	.5	1.0	1.1	1.3	1.4	1.5	1.6	1.7	2.0	2.3
Std Value	74	50	10	38	40	44	46	49	51	53	59	66
10 Raw Value	72	1.0	.2	.7	.8	.9	.9	1.0	1.1	1.1	1.2	1.3
Std Value	72	50	10	37	41	45	45	50	54	54	58	63
11 Raw Value	74	.7	.4	.4	.5	.5	.6	.6	.7	.8	1.0	1.3
Std Value	74	50	10	40	43	43	46	46	49	52	57	66
University Library												
12 Raw Value	56	.2	1.0	-1.1	-.7	-.5	-.4	.1	.3	.7	.9	1.7
Std Value	56	50	10	37	41	43	44	49	51	55	57	65
Research Support												
13 Raw Value	61	.20	.14	.00	.06	.10	.16	.19	.23	.29	.31	.38
Std Value	61	50	10	36	40	43	47	49	52	56	58	63
14 Raw Value	67	7998	8804	1869	2626	3499	4338	5214	5644	7788	10278	18482
Std Value	67	50	10	43	44	45	46	47	47	50	53	62
Publication Records												
15 Raw Value	74	12	10	1	4	6	7	9	10	13	17	27
Std Value	74	50	10	39	42	44	45	47	48	51	55	65
16 Std Value	74	50	10	38	41	44	46	48	50	51	55	66

NOTE: Standardized values reported in the preceding table have been computed from exact values of the mean and standard deviation and not the rounded values reported here. Since the scale used to compute measure 16 is entirely arbitrary, only data in standardized form are reported for this measure.

TABLE 4.3 Intercorrelations Among Program Measures on 74 Programs in Civil Engineering

	Measure															
	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16
Program Size																
01		.83	.65	.02	.08	.07	.15	.73	.70	.42	.74	.37	.28	.56	.74	.69
02			.71	.01	.16	-.11	.05	.72	.73	.18	.75	.39	.39	.51	.73	.65
03				.03	-.02	-.12	.02	.57	.57	.20	.57	.47	.31	.38	.56	.52
Program Graduates																
04					-.12	.15	-.10	.18	.17	.00	.11	.12	.03	.16	.19	.17
05						-.25	.00	.25	.26	-.06	.24	-.03	.24	-.02	.04	-.05
06							.43	.05	.02	.18	.03	-.11	-.16	-.02	.09	.10
07								.21	.22	.08	.18	-.13	.04	.21	.05	.05
Survey Results																
08									.98	.35	.94	.54	.62	.57	.62	.57
09										.30	.92	.53	.62	.55	.62	.57
10											.34	.20	.14	.04	.34	.35
11												.52	.63	.58	.63	.58
University Library																
12													.54	.26	.32	.32
Research Support																
13														.29	.27	.26
14															.44	.36
Publication Records																
15																.95
16																

NOTE: Since in computing correlation coefficients program data must be available for both of the measures being correlated, the actual number of programs on which each coefficient is based varies.

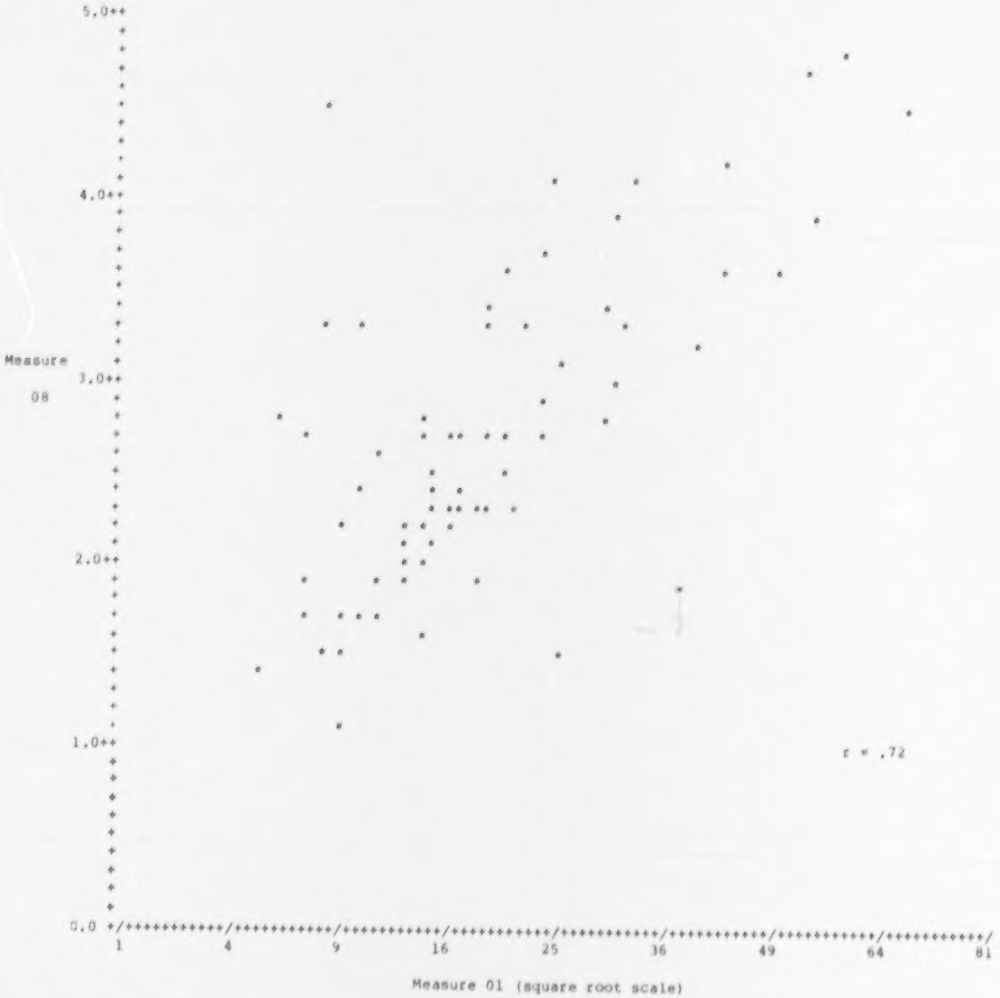

FIGURE 4.1 Mean rating of scholarly quality of faculty (measure 08) versus number of faculty members (measure 01)--74 programs in civil engineering.

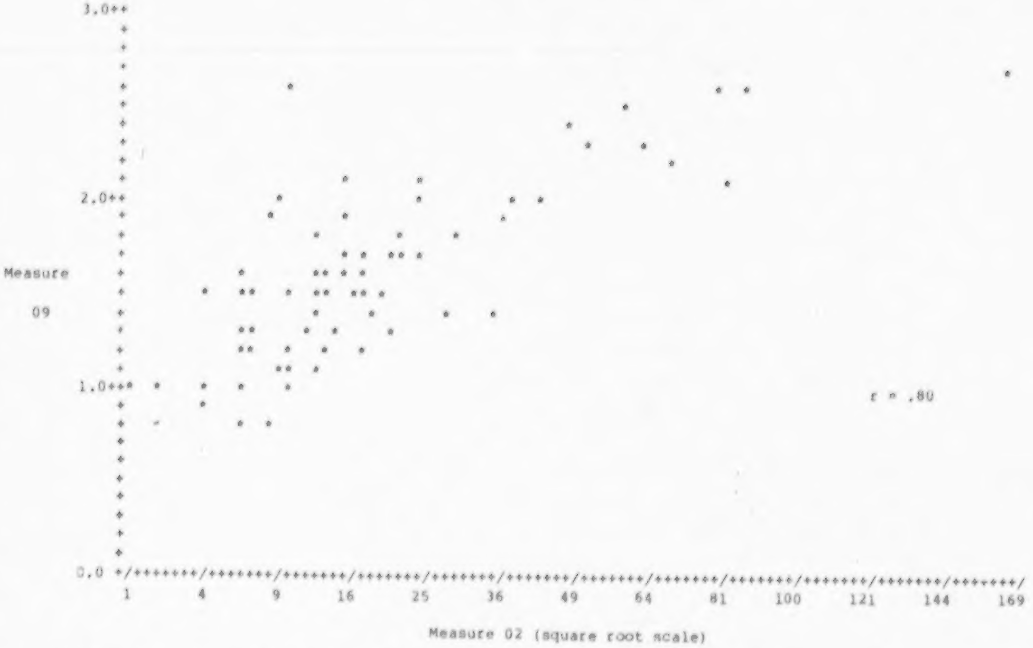

FIGURE 4.2 Mean rating of program effectiveness in educating research scholars/scientists (measure 09) versus number of graduates in last five years (measure 02)--73 programs in civil engineering.

TABLE 4.4 Characteristics of Survey Participants in Civil Engineering

	Respondents	
	N	%
Field of Specialization		
Civil Engineering	104	81
Sanitary/Environ. Engineering	15	12
Other/Unknown	10	8
Faculty Rank		
Professor	89	69
Associate Professor	24	19
Assistant Professor	16	12
Year of Highest Degree		
Pre-1950	7	5
1950-59	14	11
1960-69	70	54
Post-1969	36	28
Unknown	2	2
Evaluator Selection		
Nominated by Institution	113	88
Other	16	12
Survey Form		
With Faculty Names	118	92
Without Names	11	9
Total Evaluators	129	100

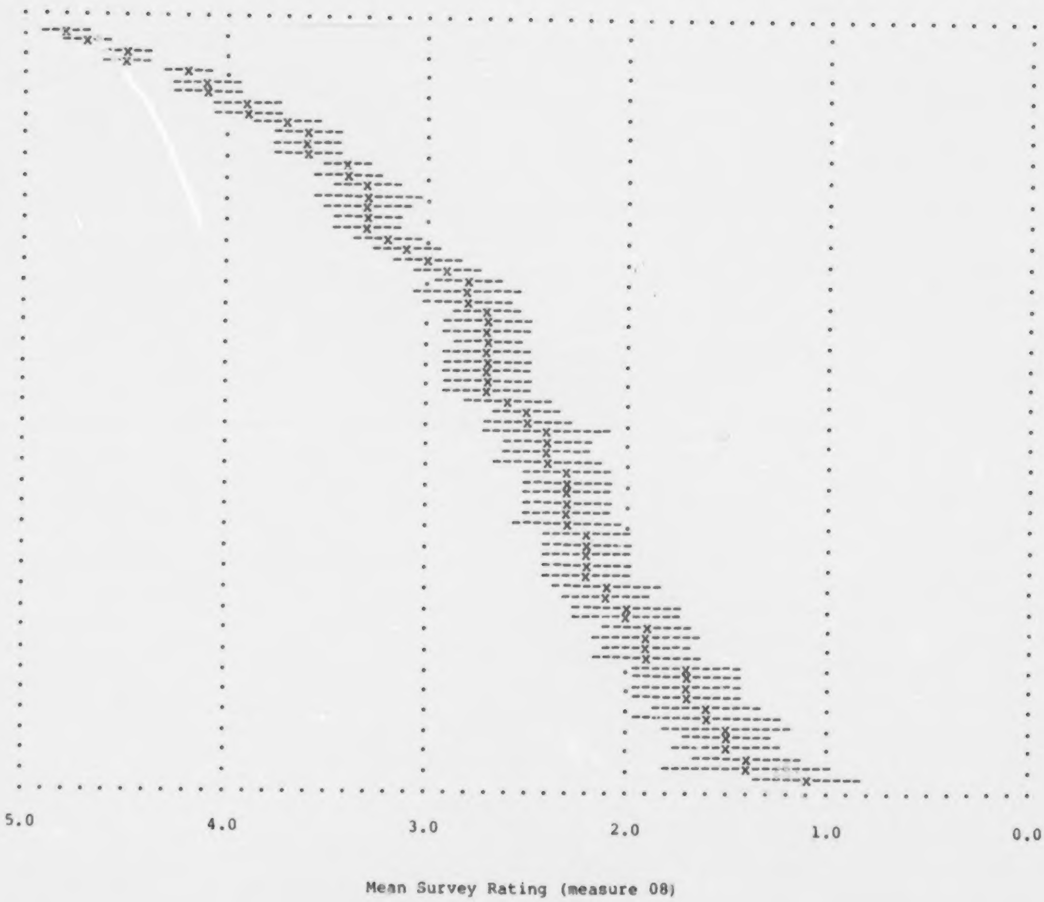

FIGURE 4.3 Mean rating of scholarly quality of faculty in 74 programs in civil engineering.

NOTE: Programs are listed in sequence of mean rating, with the highest-rated program appearing at the top of the page. The broken lines (---) indicate a confidence interval of ±1.5 standard errors around the reported mean (x) of each program.

V

Electrical Engineering Programs

In this chapter 91 research-doctorate programs in electrical engineering programs are assessed. These programs, according to the information supplied by their universities, have accounted for 2,907 doctoral degrees awarded during the FY1976-80 period--approximately 95 percent of the aggregate number of electrical engineering, electronics, and computer engineering doctorates earned from U.S. universities in this five-year span.[1] Because some computer scientists receive their doctoral education in electrical engineering departments and by the same token some electrical engineers receive their doctoral degrees in computer science departments, the committee encountered difficulty in identifying program faculty, graduates, and students in the discipline of electrical engineering.[2] On the average, 49 full-time and part-time students intending to earn doctorates were enrolled in a program in December 1980, with an average faculty size of 23 members.[3] Most of the 91 programs, listed in Table 5.1, are located in departments of electrical engineering. Approximately one-fourth are found in departments of electrical engineering and computer science. Only two of the programs were initiated since 1970, and no two programs are located in the same university. In addition to the 91 institutions represented in this discipline, another 4 were initially identified as meeting the criteria[4] for inclusion in the assessment:

---

[1] Data from the NRC's Survey of Earned Doctorates indicate that 2,239 research doctorates in electrical engineering, 371 in electronics, and another 458 research doctorates in computer engineering were awarded by U.S. universities between FY1976 and FY1980.

[2] In the review of this report it has been called to the committee's attention that electrical engineering programs have been changing very rapidly in recent years and that different programs may place substantially different emphases in fields of electronics, applied physics, and computer engineering.

[3] See the reported means for measures 03 and 01 in Table 5.2.

[4] As mentioned in Chapter I, the primary criterion for inclusion was that a university had awarded at least 7 doctorates in electrical engineering during the FY1976-78 period.

George Washington University
University of South Carolina--Columbia
Naval Postgraduate School
University of Santa Clara

The latter two institutions chose not to participate in the assessment in *any* discipline. Electrical engineering programs at the other two institutions have not been included in the evaluations in this discipline, since in each case the study coordinator either indicated that the institution did not at that time have a research-doctorate program in electrical engineering or failed to provide the information requested by the committee.

Before examining individual program results presented in Table 5.1, the reader is urged to refer to Chapter II, in which each of the 16 measures used in the assessment is discussed. Summary statistics describing every measure are given in Table 5.2. For 15 of the measures, data are reported for at least 76 of the 91 electrical engineering programs. For measure 12, a composite index of the size of a university library, data are available for 62 programs. The programs not evaluated on measure 12 are typically smaller--in terms of faculty size and graduate student enrollment--than other electrical engineering programs. Were data on this measure available for all 91 programs, it is likely that the reported mean would be appreciably lower (and that some of the correlations of this measure with others would be higher).

Intercorrelations among the 16 measures (Pearson product-moment coefficients) are given in Table 5.3. Of particular note are the high positive correlations of the measures of program size (01-03) with measures of publication records (15, 16) and reputational survey ratings (08, 09). Figure 5.1 illustrates the relation between the mean rating of the scholarly quality of faculty (measure 08) and the number of faculty members (measure 01) for each of 90 programs in electrical engineering. Figure 5.2 plots the mean rating of program effectiveness (measure 09) against the total number of FY1976-80 program graduates (measure 02). Although in both figures there is a significant positive correlation between program size and reputational rating, it is quite apparent that some of the smaller programs received high mean ratings and that some of the larger programs received low mean ratings.

Table 5.4 describes the 142 faculty members who participated in the evaluation of ~~electrical engineering programs. These in~~dividuals constituted 52 percent of those asked to respond to the survey in this discipline and 7 percent of the faculty population in the 91 research-doctorate programs being evaluated.[5] Almost one-third of the survey participants had earned their highest degree since 1970, and a majority held the rank of full professor. One exception should be noted with regard to the survey evaluations in this discipline. In the program listing on the survey form, New Mexico State University at *Las Cruces* was identified as being located in *Alamogordo*, where there is another branch of the same university system not offering the research doctorate. Since a large majority of faculty evaluators indicated that they were unfamiliar with this program and it is quite possible that some of them were misled by the inaccurate identification of this institution, the committee has decided not to report the survey results for this program.

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[5] See Table 2.3 in Chapter II.

To assist the reader in interpreting results of the survey evaluations, estimated standard errors have been computed for mean ratings of the scholarly quality of faculty in 90 electrical engineering programs (and are given in Table 5.1). For each program the mean rating and an associated "confidence interval" of 1.5 standard errors are illustrated in Figure 5.3 (listed in order of highest to lowest mean rating). In comparing two programs, if their confidence intervals do not overlap, one may conclude that there is a significant difference in their mean ratings at a .05 level of significance.[6] From this figure it is also apparent that one should have somewhat more confidence in the accuracy of the mean ratings of higher-rated programs than lower-rated programs. This generalization results primarily from the fact that evaluators are not as likely to be familiar with the less prestigious programs, and consequently the mean ratings of these programs are usually based on fewer survey responses.

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[6] See pp. 29-31 for a discussion of the interpretation of mean ratings and associated confidence intervals.

TABLE 5.1 Program Measures (Raw and Standardized Values) in Electrical Engineering

Prog No.	University - Department/Academic Unit	Program Size			Characteristics of Program Graduates			
		(01)	(02)	(03)	(04)	(05)	(06)	(07)
001.	Air Force Institute of Technology	9	14	11	.07	9.5	.93	.07
	Electrical Engineering	*41*	*45*	*43*	*40*	*25*	*67*	*41*
002.	Arizona State University-Tempe	15	15	31	.13	5.7	.47	.07
	Electrical and Computer Engineering	*44*	*45*	*47*	*45*	*59*	*33*	*41*
003.	Arizona, University of-Tucson	17	21	36	.08	7.0	.71	.17
	Electrical Engineering	*46*	*47*	*48*	*41*	*47*	*51*	*50*
004.	Auburn University	13	15	8	.09	NA	.82	.09
	Electrical Engineering	*43*	*45*	*43*	*41*		*59*	*43*
005.	Brown University	13	17	20	.21	6.1	.64	.21
	Engineering	*43*	*46*	*45*	*52*	*55*	*46*	*54*
006.	CUNY-Graduate School	14	21	31	.24	7.1	.64	.16
	Engineering	*44*	*47*	*47*	*55*	*46*	*46*	*49*
007.	California Institute of Technology	13	24	56	.29	5.0	.67	.29
	Electrical Engineering	*43*	*48*	*51*	*59*	*65*	*48*	*61*
008.	California, University of-Berkeley	48	135	211	.09	5.7	.84	.25
	Electrical Engineering & Computer Sciences	*66*	*78*	*79*	*42*	*59*	*60*	*57*
009.	California, University of-Davis	19	14	18	.07	8.5	.79	.36
	Electrical and Computer Engineering	*47*	*45*	*44*	*40*	*34*	*56*	*67*
010.	California, University of-Irvine	13	12	19	.00	8.3	.77	.08
	Engineering	*43*	*45*	*45*	*33*	*36*	*55*	*42*
011.	California, University of-Los Angeles	51	133	225	.08	7.0	.63	.08
	Engineering and Applied Science	*68*	*78*	*82*	*40*	*47*	*45*	*42*
012.	California, University of-San Diego	20	21	46	.14	6.5	.79	.21
	Electrical Engineering & Computer Science	*48*	*47*	*49*	*46*	*52*	*56*	*54*
013.	California, University of-Santa Barbara	21	33	48	.32	8.3	.72	.00
	Electrical and Computer Engineering	*48*	*50*	*50*	*62*	*36*	*52*	*35*
014.	Carnegie-Mellon University	24	54	60	.32	5.9	.82	.10
	Electrical Engineering	*50*	*56*	*52*	*62*	*57*	*59*	*44*
015.	Case Western Reserve University	16	14	6	.20	6.9	.50	.21
	Electrical Engineering and Applied Physics	*45*	*45*	*42*	*51*	*48*	*35*	*54*
016.	Catholic University of America	5	14	13	NA	NA	NA	NA
	Electrical Engineering	*38*	*45*	*44*				
017.	Cincinnati, University of	15	14	29	.18	6.5	.60	.00
	Electrical and Computer Engineering	*44*	*45*	*46*	*50*	*52*	*43*	*35*
018.	Clarkson College of Technology	19	7	13	NA	NA	NA	NA
	Engineering Science	*47*	*43*	*44*				
019.	Colorado State University-Fort Collins	16	16	20	.17	5.1	.58	.08
	Electrical Engineering	*45*	*46*	*45*	*48*	*64*	*41*	*42*
020.	Colorado, University of	51	16	28	.32	8.0	.94	.11
	Electrical Engineering	*68*	*46*	*46*	*62*	*38*	*68*	*45*

* indicates program was initiated since 1970.

NOTE: On the first line of data for every program, raw values for each measure are reported; on the second line values are reported in standardized form, with mean = 50 and standard deviation = 10. "NA" indicates that the value for a measure is not available.

TABLE 5.1 Program Measures (Raw and Standardized Values) in Electrical Engineering

Prog No.	Survey Results				University Library	Research Support		Published Articles		Survey Ratings Standard Error			
	(08)	(09)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(08)	(09)	(10)	(11)
001.	1.5	1.0	0.9	0.5	NA	NA	NA	0		.14	.09	.09	.06
	37	*37*	*45*	*44*				*41*	*41*				
002.	2.3	1.3	1.4	0.4	-0.3	.00	NA	3		.13	.12	.13	.07
	46	*44*	*68*	*42*	*45*	*34*		*42*	*43*				
003.	2.9	1.8	1.3	0.6	0.9	.24	5261	11		.12	.08	.09	.07
	53	*55*	*60*	*48*	*57*	*48*	*47*	*45*	*47*				
004.	1.8	1.4	1.1	0.3	NA	.08	2450	16		.17	.13	.11	.07
	41	*44*	*53*	*39*		*38*	*44*	*47*	*45*				
005.	3.0	1.8	1.0	0.7	-1.1	.69	3497	23		.12	.08	.09	.08
	55	*55*	*46*	*49*	*38*	*75*	*45*	*50*	*50*				
006.	2.2	1.5	0.8	0.6	NA	.14	NA	15		.12	.09	.12	.06
	45	*48*	*39*	*46*		*42*		*47*	*45*				
007.	3.7	2.2	0.9	1.0	NA	.23	8339	26		.14	.08	.08	.07
	63	*63*	*45*	*57*		*48*	*51*	*52*	*50*				
008.	4.8	2.8	1.2	1.6	2.2	.69	16448	110		.06	.06	.08	.07
	75	*75*	*55*	*77*	*70*	*75*	*60*	*87*	*87*				
009.	2.5	1.5	1.2	0.7	0.6	.47	3136	26		.13	.11	.13	.07
	49	*47*	*56*	*48*	*55*	*62*	*45*	*52*	*51*				
010.	2.1	1.3	1.0	0.7	NA	.23	NA	12		.13	.08	.08	.07
	45	*44*	*48*	*49*		*48*		*46*	*46*				
011.	4.1	2.4	1.2	1.4	2.0	.47	6168	60		.09	.06	.08	.07
	67	*67*	*58*	*70*	*68*	*62*	*48*	*66*	*63*				
012.	3.3	1.7	1.5	0.8	-0.0	.45	NA	20		.15	.09	.10	.08
	58	*53*	*68*	*52*	*48*	*61*		*49*	*51*				
013.	3.2	1.9	1.7	0.9	-0.1	.29	NA	23		.09	.07	.07	.08
	57	*56*	*80*	*55*	*47*	*51*		*50*	*51*				
014.	3.6	2.2	1.4	1.1	NA	.58	6409	42		.09	.05	.08	.08
	62	*62*	*65*	*61*		*69*	*49*	*58*	*64*				
015.	2.7	1.7	0.8	0.8	-1.3	.38	8676	13		.11	.08	.07	.08
	51	*52*	*39*	*52*	*35*	*56*	*51*	*46*	*44*				
016.	0.8	0.8	0.8	0.3	NA	NA	NA	9		.14	.11	.11	.06
	29	*32*	*41*	*37*				*44*	*45*				
017.	1.8	1.2	1.2	0.4	-0.2	.20	2360	4		.14	.11	.10	.06
	40	*41*	*55*	*41*	*46*	*46*	*44*	*42*	*45*				
018.	1.3	0.8	0.8	0.4	NA	.37	1791	9		.13	.08	.10	.07
	35	*32*	*39*	*42*		*56*	*43*	*44*	*44*				
019.	2.4	1.4	1.2	0.6	-1.1	.31	8604	7		.14	.09	.14	.07
	47	*46*	*58*	*47*	*37*	*53*	*51*	*44*	*44*				
020.	3.2	1.7	1.2	1.0	-0.9	.24	1849	50		.11	.07	.08	.07
	57	*53*	*55*	*57*	*40*	*48*	*43*	*62*	*57*				

NOTE: On the first line of data for every program, raw values for each measure are reported; on the second line values are reported in standardized form, with mean = 50 and standard deviation = 10. "NA" indicates that the value for a measure is not available. Since the scale used to compute measure 16 is entirely arbitrary, only values in standardized form are reported for this measure.

TABLE 5.1 Program Measures (Raw and Standardized Values) in Electrical Engineering

Prog No.	University - Department/Academic Unit	Program Size			Characteristics of Program Graduates			
		(01)	(02)	(03)	(04)	(05)	(06)	(07)
021.	Columbia University	15	29	38	.10	6.1	.50	.04
	Electrical Engineering	*44*	*49*	*48*	*42*	*55*	*35*	*38*
022.	Connecticut, University of-Storrs	12	15	23	.25	7.5	.83	.42
	Electrical Engineering & Computer Science	*42*	*45*	*45*	*56*	*43*	*60*	*72*
023.	Cornell University-Ithaca	35	67	79	.15	5.5	.75	.23
	Electrical Engineering	*58*	*60*	*55*	*47*	*60*	*54*	*56*
024.	Drexel University	23	13	36	NA	NA	NA	NA
	Electrical Engineering	*50*	*45*	*48*				
025.	Duke University	12	21	20	.17	5.4	.48	.04
	Electrical Engineering	*42*	*47*	*45*	*49*	*61*	*34*	*39*
026.	Florida, University of-Gainesville	36	38	158	.14	5.9	.56	.33
	Electrical Engineering	*58*	*52*	*70*	*46*	*57*	*39*	*65*
027.	Georgia Institute of Technology	22	20	37	.21	6.7	.78	.39
	Electrical Engineering	*49*	*47*	*48*	*52*	*50*	*56*	*70*
028.	Hawaii, University of	17	13	12	.13	6.8	.60	.07
	Electrical Engineering	*46*	*45*	*43*	*44*	*49*	*43*	*41*
029.	Houston, University of	12	13	25	.36	7.3	.50	.10
	Electrical Engineering	*42*	*45*	*46*	*66*	*45*	*35*	*44*
030.	Illinois Institute of Technology	9	17	23	.29	7.5	.57	.14
	Electrical Engineering	*41*	*46*	*45*	*59*	*43*	*40*	*48*
031.	Illinois, University of-Chicago Circle	21	12	54	NA	NA	NA	NA
	*Information Engineering**	*48*	*45*	*51*				
032.	Illinois, University-Urbana/Champaign	87	148	166	.06	5.6	.82	.25
	Electrical Engineering	*92*	*82*	*71*	*38*	*59*	*59*	*58*
033.	Iowa State University-Ames	15	31	29	.25	5.9	.66	.13
	Electrical Engineering	*44*	*50*	*46*	*56*	*57*	*47*	*46*
034.	Iowa, University of-Iowa City	13	9	15	.27	5.3	.55	.27
	Electrical and Computer Engineering	*43*	*44*	*44*	*58*	*63*	*39*	*59*
035.	Johns Hopkins University	13	34	39	.24	5.3	.90	.14
	Electrical Engineering	*43*	*51*	*48*	*55*	*63*	*65*	*47*
036.	Kansas, University of	20	17	26	.20	7.5	.75	.10
	Electrical Engineering	*48*	*46*	*46*	*51*	*43*	*54*	*44*
037.	Marquette University	21	21	15	.37	6.9	.74	.16
	Electrical Engineering and Computer Science	*48*	*47*	*44*	*66*	*48*	*53*	*49*
038.	Maryland, University of-College Park	28	21	134	.13	8.6	.69	.00
	Electrical Engineering	*53*	*47*	*65*	*45*	*33*	*49*	*35*
039.	Massachusetts Institute of Technology	80	141	299	.41	5.8	.74	.28
	Electrical Engineering and Computer Science	*87*	*80*	*95*	*70*	*58*	*53*	*60*
040.	Massachusetts, University of-Amherst	18	22	43	.17	6.1	.94	.11
	Electrical and Computer Engineering	*46*	*47*	*49*	*48*	*55*	*68*	*45*

* indicates program was initiated since 1970.

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TABLE 5.1 Program Measures (Raw and Standardized Values) in Electrical Engineering

Prog No.	Survey Results				University Library	Research Support		Published Articles		Survey Ratings Standard Error			
	(08)	(09)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(08)	(09)	(10)	(11)
021.	3.2	2.0	0.8	1.0	1.7	.53	5375	15		.11	.08	.09	.08
	57	58	39	59	66	66	47	47	46				
022.	2.2	1.5	1.3	0.6	-0.5	.25	4069	11		.16	.10	.10	.07
	46	48	60	47	43	49	46	45	46				
023.	4.0	2.3	1.3	1.3	1.6	.26	13206	39		.09	.06	.07	.07
	66	66	61	66	65	49	56	57	55				
024.	1.9	1.3	1.1	0.5	NA	.22	2649	12		.11	.10	.07	.07
	42	43	51	45		47	44	46	45				
025.	2.4	1.6	1.0	0.6	0.3	.17	NA	9		.11	.07	.06	.06
	47	49	49	47	52	44		44	44				
026.	3.2	1.8	1.2	0.9	0.8	.31	13686	23		.10	.06	.10	.07
	56	55	55	57	56	52	57	50	49				
027.	3.2	1.9	1.3	1.0	NA	.27	29270	26		.10	.06	.10	.08
	57	56	62	57		50	75	52	51				
028.	2.8	1.6	1.0	0.8	-0.1	.24	2010	11		.17	.10	.11	.09
	52	50	48	54	47	48	43	45	47				
029.	1.5	1.2	0.9	0.5	-0.9	.17	5015	26		.14	.12	11	.07
	37	41	45	44	39	44	47	52	49				
030.	1.8	1.2	0.6	0.5	NA	NA	NA	6		.21	.14	.10	.07
	41	41	32	44				43	45				
031.	2.2	1.5	1.3	0.5	NA	.14	2144	9		.21	.12	.15	.08
	45	47	61	45		42	44	44	48				
032.	4.6	2.6	1.1	1.7	2.0	.51	18980	128		.07	.06	.09	.07
	73	73	51	77	68	64	63	95	88				
033.	2.6	1.6	0.8	0.4	-0.5	.07	8330	12		.15	.09	.10	.07
	49	50	38	42	43	38	51	46	45				
034.	1.9	1.2	0.8	0.5	0.3	.39	2117	6		.17	.11	.08	.07
	42	42	40	43	51	57	44	43	43				
035.	3.1	1.9	0.9	0.8	-0.4	.15	1741	9		.09	.06	.08	.07
	56	57	44	51	44	43	43	44	45				
036.	2.3	1.5	1.1	0.4	0.1	.20	1707	22		.17	.11	.09	.07
	46	48	53	42	49	46	43	50	50				
037.	1.6	1.1	1.1	0.2	NA	.05	NA	4		.17	.14	.11	.04
	39	39	51	35		37		42	42				
038.	3.3	1.9	1.3	0.9	0.2	.36	3519	50		.11	.06	.09	.08
	58	57	62	55	50	55	45	62	61				
039.	4.9	2.7	1.0	1.8	-0.3	.41	59143	99		.04	.05	.07	.06
	76	75	47	80	45	59	99	82	88				
040.	2.7	1.7	1.2	0.9	-0.7	.61	2256	18		.12	.08	.11	.09
	51	51	58	55	41	70	44	48	48				

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TABLE 5.1 Program Measures (Raw and Standardized Values) in Electrical Engineering

Prog No.	University - Department/Academic Unit	Program Size			Characteristics of Program Graduates			
		(01)	(02)	(03)	(04)	(05)	(06)	(07)
041.	Michigan State University-East Lansing	24	26	40	.14	5.6	.54	.04
	Electrical Engineering & Systems Science	*50*	*48*	*48*	*46*	*59*	*38*	*38*
042.	Michigan, University of-Ann Arbor	51	23	60	.15	7.4	.75	.13
	Electrical and Computer Engineering	*68*	*48*	*52*	*47*	*44*	*54*	*46*
043.	Minnesota, University of	37	24	28	.20	8.3	.64	.12
	Electrical Engineering	*59*	*48*	*46*	*51*	*36*	*46*	*46*
044.	Mississippi State University-Starkville	19	12	11	.18	7.8	.91	.18
	Electrical Engineering	*47*	*45*	*43*	*50*	*41*	*66*	*51*
045.	Missouri, University of-Columbia	15	33	39	.05	5.1	.68	.16
	Electrical Engineering	*44*	*50*	*48*	*38*	*64*	*48*	*49*
046.	Missouri, University of-Rolla	25	23	11	.08	5.4	.71	.17
	Electrical Engineering	*5[illegible]*	*48*	*43*	*40*	*61*	*51*	*50*
047.	New Jersey Institute of Technology	29	10	NA	NA	NA	NA	NA
	Electrical Engineering	*54*	*44*					
048.	New Mexico State University-Las Cruces	19	15	70	.27	6.4	.70	.10
	Electrical and Computer Engineering	*47*	*45*	*54*	*58*	*53*	*50*	*44*
049.	New Mexico, University of-Albuquerque	23	24	33	.09	8.6	.70	.22
	Electrical and Computer Engineering	*50*	*48*	*47*	*41*	*33*	*50*	*54*
050.	North Carolina State University-Raleigh	29	15	32	.31	7.5	.56	.06
	Electrical Engineering	*54*	*45*	*47*	*61*	*43*	*40*	*41*
051.	Northeastern University	25	10	9	.42	8.5	.64	.00
	Electrical Engineering	*51*	*44*	*43*	*71*	*34*	*45*	*35*
052.	Northwestern University	40	39	16	.27	6.2	.66	.24
	Electrical Engineering & Computer Sciences	*61*	*52*	*44*	*57*	*55*	*47*	*57*
053.	Notre Dame, University of	10	11	11	NA	NA	NA	NA
	Electrical Engineering	*41*	*44*	*43*				
054.	Ohio State University-Columbus	51	66	95	.08	6.0	.57	.16
	Electrical Engineering	*68*	*59*	*58*	*40*	*56*	*40*	*49*
055.	Ohio University-Athens	9	7	63	NA	NA	NA	NA
	Electrical Engineering	*41*	*43*	*53*				
056.	Oklahoma State University-Stillwater	14	14	10	.19	5.8	.50	.06
	Electrical Engineering	*44*	*45*	*43*	*50*	*57*	*35*	*41*
057.	Oklahoma, University of-Norman	15	16	18	NA	5.5	NA	NA
	Electrical Engineering and Computer Science	*44*	*46*	*44*		*60*		
058.	Oregon State University-Corvallis	17	21	30	.06	7.3	.50	.11
	Electrical and Computer Engineering	*46*	*47*	*47*	*38*	*45*	*35*	*45*
059.	Pennsylvania State University	25	24	23	.39	7.6	.80	.20
	Electrical Engineering	*51*	*48*	*45*	*68*	*42*	*58*	*53*
060.	Pennsylvania, University of	15	31	21	.15	9.3	.81	.07
	Electrical Engineering and Science	*44*	*50*	*45*	*47*	*27*	*58*	*41*

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TABLE 5.1 Program Measures (Raw and Standardized Values) in Electrical Engineering

Prog No.	Survey Results				University Library	Research Support		Published Articles		Survey Ratings Standard Error			
	(08)	(09)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(08)	(09)	(10)	(11)
041.	2.6	1.7	0.8	0.6	0.3	.17	2247	12		.14	.07	.09	.08
	50	*53*	*38*	*48*	*52*	*44*	*44*	*46*	*45*				
042.	3.8	2.1	0.8	1.3	1.8	.28	19835	28		.08	.05	.07	.06
	64	*61*	*37*	*67*	*66*	*50*	*64*	*53*	*53*				
043.	3.2	1.9	1.0	0.8	1.2	.49	8726	49		.10	.07	.09	.08
	57	*56*	*46*	*54*	*60*	*63*	*51*	*61*	*64*				
044.	1.3	0.8	0.9	0.4	NA	.05	2463	5		.15	.09	.12	.07
	35	*32*	*44*	*40*		*37*	*44*	*43*	*43*				
045.	2.1	1.3	0.8	0.4	-0.2	.07	1976	5		.13	.12	.11	.07
	44	*44*	*40*	*42*	*46*	*38*	*43*	*43*	*42*				
046.	2.5	1.6	1.1	0.6	NA	.12	3606	10		.13	.09	.09	.07
	49	*51*	*51*	*47*		*41*	*45*	*45*	*46*				
047.	1.3	0.8	1.1	0.3	NA	.00	NA	1		.14	.09	.11	.06
	35	*33*	*50*	*38*		*34*		*41*	*41*				
048.	NA	NA	NA	NA	NA	.00	14876	2		NA	NA	NA	NA
						34	*58*	*42*	*42*				
049.	2.1	1.5	1.2	0.6	-1.0	.13	6575	6		.12	.09	.10	.08
	44	*47*	*58*	*48*	*39*	*42*	*49*	*43*	*43*				
050.	2.5	1.6	1.5	0.6	NA	.28	8416	20		.14	.09	.10	.08
	49	*50*	*68*	*47*		*50*	*51*	*49*	*49*				
051.	2.0	1.1	1.0	0.5	NA	.00	1486	7		.14	.11	.10	.07
	42	*40*	*48*	*43*		*34*	*43*	*44*	*44*				
052.	3.1	1.9	1.0	0.9	0.3	.35	5170	17		.11	.06	.09	.08
	56	*57*	*48*	*55*	*51*	*55*	*47*	*48*	*52*				
053.	2.7	1.6	1.0	0.8	-1.3	.30	1544	5		.13	.08	.10	.07
	51	*49*	*48*	*52*	*35*	*52*	*43*	*43*	*43*				
054.	3.3	1.9	1.0	0.9	0.9	.14	10926	59		.11	.07	.10	.08
	58	*57*	*49*	*55*	*57*	*42*	*54*	*66*	*63*				
055.	1.1	0.7	0.7	0.3	NA	NA	NA	1		.16	.12	.14	.05
	32	*30*	*35*	*39*				*41*	*42*				
056.	1.9	1.4	1.0	0.4	-1.9	.00	4120	7		.14	.09	.11	.06
	42	*44*	*48*	*40*	*29*	*34*	*46*	*44*	*42*				
057.	1.6	1.0	0.7	0.4	-0.6	.00	1834	5		.13	.10	.09	.07
	38	*36*	*35*	*41*	*43*	*34*	*43*	*43*	*43*				
058.	1.8	1.3	1.3	0.3	NA	.24	3128	6		.16	.11	.11	.06
	40	*43*	*59*	*39*		*48*	*45*	*43*	*44*				
059.	2.8	1.8	0.9	0.6	0.7	.40	22901	28		.10	.09	.10	.07
	52	*54*	*44*	*47*	*55*	*58*	*68*	*53*	*55*				
060.	3.0	1.9	0.9	0.6	0.7	.13	4579	30		.12	.07	.08	.07
	55	*56*	*44*	*46*	*55*	*42*	*46*	*53*	*52*				

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TABLE 5.1 Program Measures (Raw and Standardized Values) in Electrical Engineering

Prog No.	University - Department/Academic Unit	Program Size			Characteristics of Program Graduates			
		(01)	(02)	(03)	(04)	(05)	(06)	(07)
061.	Pittsburgh, University of	20	31	31	.07	6.5	.76	.14
	Electrical Engineering	*48*	*50*	*47*	*39*	*52*	*54*	*47*
062.	Polytech Institute of New York	21	65	56	.13	8.5	.64	.07
	Electrical Engineering and Computer Science	*48*	*65*	*51*	*44*	*34*	*46*	*42*
063.	Princeton University	10	42	48	.13	4.4	.78	.36
	Electrical Engineering and Computer Science	*41*	*53*	*50*	*45*	*70*	*56*	*67*
064.	Purdue University-West Lafayette	55	108	115	.16	5.4	.74	.16
	Electrical Engineering	*71*	*71*	*62*	*47*	*62*	*53*	*49*
065.	Rensselaer Polytechnic Institute	39	37	69	.14	6.1	.81	.10
	Electrical, Computer, & Systems Engineering	*60*	*51*	*54*	*46*	*55*	*58*	*43*
066.	Rhode Island, University of	16	12	17	.08	9.5	.64	.00
	Electrical Engineering	*45*	*45*	*44*	*41*	*25*	*45*	*35*
067.	Rice University	16	32	42	.28	5.3	.68	.26
	Electrical Engineering	*45*	*50*	*49*	*58*	*62*	*48*	*58*
068.	Rochester, University of	12	8	15	.40	7.2	1.00	.60
	Electrical Engineering	*42*	*43*	*44*	*69*	*46*	*72*	*89*
069.	Rutgers, The State University-New Brunswick	13	16	159	.27	7.0	.55	.09
	Electrical Engineering	*43*	*46*	*70*	*58*	*47*	*39*	*43*
070.	SUNY at Buffalo	20	28	29	.04	6.5	.73	.23
	Electrical Engineering	*48*	*49*	*46*	*37*	*52*	*52*	*55*
071.	SUNY at Stony Brook	14	21	62	.21	5.6	.56	.06
	Electrical Engineering	*44*	*47*	*52*	*52*	*59*	*39*	*40*
072.	Southern California, University of	58	147	116	.18	6.9	.66	.06
	Electrical Engineering	*73*	*82*	*62*	*49*	*48*	*47*	*40*
073.	Southern Methodist University	13	29	48	.18	6.2	.45	.07
	Electrical Engineering	*43*	*49*	*50*	*50*	*54*	*32*	*41*
074.	Stanford University	61	212	253	.18	6.4	.81	.24
	Electrical Engineering	*75*	*99*	*87*	*49*	*53*	*58*	*57*
075.	Syracuse University	32	25	30	.26	8.3	.90	.16
	Electrical and Computer Engineering	*56*	*48*	*47*	*56*	*36*	*65*	*49*
076.	Tennessee, University of-Knoxville	22	17	20	.24	6.3	.67	.10
	Electrical Engineering	*49*	*46*	*45*	*55*	*54*	*48*	*43*
077.	Texas A & M University	18	14	16	.07	6.8	.39	.15
	Electrical Engineering	*46*	*45*	*44*	*40*	*49*	*27*	*49*
078.	Texas Tech University-Lubbock	21	21	19	.21	5.3	.72	.33
	Electrical Engineering	*48*	*47*	*45*	*52*	*63*	*52*	*65*
079.	Texas, University of-Arlington	13	11	32	.00	5.3	.80	.20
	Electrical Engineering	*43*	*44*	*47*	*33*	*62*	*58*	*53*
080.	Texas, University of-Austin	37	52	56	.17	6.8	.57	.24
	Electrical Engineering	*59*	*55*	*51*	*48*	*49*	*40*	*57*

* indicates program was initiated since 1970.

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TABLE 5.1 Program Measures (Raw and Standardized Values) in Electrical Engineering

Prog No.	Survey Results				University Library	Research Support		Published Articles		Survey Ratings Standard Error			
	(08)	(09)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(08)	(09)	(10)	(11)
061.	2.4	1.4	0.9	0.7	0.1	.25	2794	19		.12	.10	.08	.07
	48	*46*	*45*	*48*	*49*	*49*	*44*	*49*	*47*				
062.	3.6	2.1	0.7	0.9	NA	.14	5310	11		.11	.06	.08	.07
	61	*62*	*33*	*56*		*42*	*47*	*45*	*46*				
063.	3.7	2.2	0.7	1.1	0.9	.50	6358	20		.12	.09	.08	.09
	63	*63*	*35*	*61*	*57*	*64*	*48*	*49*	*53*				
064.	3.9	2.3	1.0	1.5	-0.5	.40	17331	69		.10	.06	.07	.06
	65	*65*	*46*	*71*	*43*	*58*	*61*	*70*	*68*				
065.	3.3	1.8	1.5	1.1	NA	.36	7849	31		.10	.06	.07	.07
	58	*55*	*72*	*62*		*55*	*50*	*54*	*52*				
066.	2.1	1.2	1.1	0.3	NA	.31	2611	6		.16	.08	.08	.06
	45	*42*	*53*	*39*		*53*	*44*	*43*	*43*				
067.	3.0	1.9	1.1	0.9	-1.4	.56	1782	11		.12	.06	.10	.09
	55	*57*	*51*	*57*	*34*	*68*	*43*	*45*	*46*				
068.	2.3	1.4	1.0	0.6	-0.6	.33	16764	8		.14	.13	.11	.07
	46	*46*	*46*	*45*	*42*	*54*	*61*	*44*	*46*				
069.	1.8	1.1	0.8	0.4	0.8	.08	1877	21		.14	.09	.10	.06
	40	*39*	*39*	*41*	*56*	*38*	*43*	*50*	*50*				
070.	2.3	1.5	1.1	0.6	0.3	.25	3019	25		.12	.09	.10	.07
	46	*47*	*54*	*48*	*51*	*49*	*45*	*51*	*50*				
071.	2.4	1.5	0.8	0.6	-0.6	.43	1539	14		.11	.10	.09	.06
	48	*48*	*39*	*45*	*42*	*60*	*43*	*47*	*47*				
072.	4.1	2.3	1.4	1.4	0.4	.33	18269	59		.08	.07	.08	.07
	67	*65*	*64*	*69*	*52*	*53*	*62*	*66*	*64*				
073.	2.4	1.5	0.6	0.6	NA	.23	NA	10		.12	.09	.11	.07
	48	*49*	*30*	*46*		*48*		*45*	*45*				
074.	4.8	2.7	1.1	1.7	2.0	.57	25196	92		.06	.05	.08	.06
	75	*75*	*54*	*78*	*69*	*68*	*70*	*80*	*86*				
075.	2.9	1.8	0.9	0.8	-0.3	.19	4063	30		.11	.07	.08	.07
	54	*53*	*43*	*53*	*45*	*45*	*46*	*53*	*51*				
076.	2.3	1.5	1.1	0.4	-0.4	.05	4266	5		.13	.12	.10	.07
	47	*48*	*54*	*41*	*44*	*37*	*46*	*43*	*43*				
077.	2.1	1.3	1.1	0.6	-0.5	.17	18988	27		.15	.11	.11	.08
	45	*44*	*54*	*47*	*44*	*44*	*63*	*52*	*48*				
078.	2.4	1.6	1.4	0.6	NA	.38	5513	14		.12	.10	.09	.08
	47	*51*	*68*	*47*		*57*	*47*	*47*	*46*				
079.	1.7	1.1	1.3	0.4	NA	.00	NA	0		.17	.13	.11	.07
	40	*39*	*63*	*41*		*34*		*41*	*41*				
080.	3.5	2.0	1.3	0.9	1.6	.19	10517	39		.09	.05	.09	.07
	60	*59*	*60*	*56*	*65*	*45*	*53*	*57*	*60*				

NOTE: On the first line of data for every program, raw values for each measure are reported; on the second line values are reported in standardized form, with mean = 50 and standard deviation = 10. "NA" indicates that the value for a measure is not available. Since the scale used to compute measure 16 is entirely arbitrary, only values in standardized form are reported for this measure.

TABLE 5.1 Program Measures (Raw and Standardized Values) in Electrical Engineering

Prog No.	University - Department/Academic Unit	Program Size			Characteristics of Program Graduates			
		(01)	(02)	(03)	(04)	(05)	(06)	(07)
081.	Utah State University-Logan	14	11	1	NA	NA	NA	NA
	Electrical Engineering	*44*	*44*	*41*				
082.	Utah, University of-Salt Lake City	12	16	15	.62	7.5	.62	.15
	Electrical Engineering	*42*	*46*	*44*	*88*	*43*	*44*	*49*
083.	Vanderbilt University	10	11	19	.10	NA	.90	.30
	Electrical and Biomedical Engineering	*41*	*44*	*45*	*42*		*65*	*62*
084.	Virginia Polytechnic Institute & State Univ	35	17	49	.07	6.6	.87	.33
	Electrical Engineering	*58*	*46*	*50*	*39*	*51*	*62*	*65*
085.	Virginia, University of	14	19	15	.19	6.2	.69	.19
	Electrical Engineering	*44*	*46*	*44*	*50*	*54*	*49*	*52*
086.	Washington University-Saint Louis	15	18	21	.41	6.6	.75	.38
	Electrical Engineering	*44*	*46*	*45*	*70*	*50*	*54*	*69*
087.	Washington, University of-Seattle	37	31	36	.11	7.1	.75	.22
	Electrical Engineering	*59*	*50*	*48*	*43*	*46*	*54*	*55*
088.	Wayne State University	11	10	17	.10	NA	1.00	.30
	Electrical and Computer Engineering	*42*	*44*	*44*	*42*		*72*	*62*
089.	West Virginia University	16	9	11	NA	NA	NA	NA
	Electrical Engineering	*45*	*44*	*43*				
090.	Wisconsin, University of-Madison	28	45	136	.13	6.9	.76	.22
	Electrical and Computer Engineering	*53*	*54*	*66*	*45*	*48*	*55*	*54*
091.	Yale University	18	16	30	.09	5.9	.62	.14
	Engineering and Applied Science	*46*	*46*	*47*	*41*	*56*	*44*	*48*

* indicates program was initiated since 1970.

NOTE: On the first line of data for every program, raw values for each measure are reported; on the second line values are reported in standardized form, with mean = 50 and standard deviation = 10. "NA" indicates that the value for a measure is not available.

TABLE 5.1 Program Measures (Raw and Standardized Values) in Electrical Engineering

Prog No.	Survey Results				University Library	Research Support		Published Articles		Survey Ratings Standard Error			
	(08)	(09)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(08)	(09)	(10)	(11)
081.	1.4	1.1	0.9	0.3	NA	.29	5513	4		.15	.10	.12	.06
	36	*38*	*45*	*37*		*51*	*47*	*42*	*42*				
082.	2.3	1.5	1.1	0.4	-0.6	.33	7123	20		.17	.10	.13	.06
	46	*47*	*51*	*40*	*42*	*54*	*49*	*49*	*49*				
083.	1.4	0.8	0.8	0.3	-0.7	.30	NA	6		.16	.10	.08	.05
	36	*32*	*40*	*37*	*41*	*52*		*43*	*43*				
084.	2.6	1.6	1.3	0.6	-0.0	.20	7243	21		.13	.09	.10	.07
	50	*51*	*60*	*45*	*48*	*46*	*49*	*50*	*49*				
085.	2.2	1.4	1.3	0.6	0.7	.21	4673	19		.12	.10	.09	.06
	45	*45*	*61*	*46*	*56*	*47*	*46*	*49*	*46*				
086.	2.4	1.6	0.9	0.6	-0.4	.47	5257	9		.12	.09	.10	.07
	48	*51*	*43*	*47*	*44*	*62*	*47*	*44*	*46*				
087.	3.0	1.8	1.3	0.8	1.5	.30	5430	11		.11	.06	.09	.07
	55	*54*	*59*	*53*	*63*	*52*	*47*	*45*	*46*				
088.	1.8	1.1	0.7	0.5	-0.4	.27	2693	16		.13	.12	.14	.08
	41	*38*	*33*	*45*	*45*	*50*	*44*	*47*	*47*				
089.	1.5	1.0	1.1	0.3	NA	.13	4618	8		.16	.11	.11	.06
	38	*38*	*52*	*37*		*41*	*46*	*44*	*44*				
090.	3.1	1.9	0.9	0.9	1.6	.25	9919	48		.10	.06	.08	.07
	56	*56*	*42*	*55*	*64*	*49*	*53*	*61*	*60*				
091.	2.9	1.8	0.9	1.0	2.1	.56	2510	17		.11	.06	.10	.07
	54	*54*	*43*	*57*	*69*	*67*	*44*	*48*	*48*				

NOTE: On the first line of data for every program, raw values for each measure are reported; on the second line values are reported in standardized form, with mean = 50 and standard deviation = 10. "NA" indicates that the value for a measure is not available. Since the scale used to compute measure 16 is entirely arbitrary, only values in standardized form are reported for this measure.

TABLE 5.2 Summary Statistics Describing Each Program Measure--Electrical Engineering

Measure	Number of Programs Evaluated	Mean	Standard Deviation	DECILES 1	2	3	4	5	6	7	8	9
Program Size												
01 Raw Value	91	23	15	12	13	14	16	18	21	24	31	47
Std Value	91	50	10	42	43	44	45	46	48	50	55	65
02 Raw Value	91	32	37	11	13	15	16	21	22	27	33	65
Std Value	91	50	10	44	45	45	46	47	47	49	50	59
03 Raw Value	90	49	55	11	15	19	23	30	36	46	60	116
Std Value	90	50	10	43	44	45	45	47	48	49	52	62
Program Graduates												
04 Raw Value	81	.19	.11	.07	.08	.12	.14	.17	.19	.23	.27	.32
Std Value	81	50	10	39	40	44	45	48	50	54	57	62
05 Raw Value	79	6.7	1.1	8.5	7.5	7.2	6.9	6.6	6.2	5.9	5.6	5.3
Std Value	79	50	10	34	43	45	48	51	54	57	59	62
06 Raw Value	81	.70	.13	.50	.57	.63	.66	.70	.74	.77	.81	.89
Std Value	81	50	10	35	40	45	47	50	53	55	58	65
07 Raw Value	81	.17	.11	.04	.07	.10	.12	.15	.17	.22	.25	.33
Std Value	81	50	10	38	41	44	45	48	50	55	57	65
Survey Results												
08 Raw Value	90	2.6	.9	1.5	1.8	2.1	2.3	2.4	2.7	3.0	3.2	3.7
Std Value	90	50	10	37	41	44	47	48	51	55	57	63
09 Raw Value	90	1.6	.5	1.0	1.2	1.4	1.5	1.6	1.7	1.8	1.9	2.2
Std Value	90	50	10	37	41	46	48	50	52	54	57	63
10 Raw Value	90	1.1	.2	.8	.8	.9	1.0	1.0	1.1	1.2	1.3	1.3
Std Value	90	50	10	39	39	43	48	48	52	57	61	61
11 Raw Value	90	.7	.4	.3	.4	.5	.6	.6	.7	.8	.9	1.1
Std Value	90	50	10	38	41	44	47	47	50	53	55	61
University Library												
12 Raw Value	62	.2	1.0	-1.1	-.6	-.5	-.3	.0	.3	.7	.9	1.7
Std Value	62	50	10	37	42	43	45	48	51	55	57	65
Research Support												
13 Raw Value	87	.27	.17	.05	.13	.17	.23	.25	.29	.33	.40	.50
Std Value	87	50	10	37	42	44	48	49	51	54	58	64
14 Raw Value	76	7679	8560	1817	2249	2684	3789	5015	5513	7945	10397	17706
Std Value	76	50	10	43	44	44	45	47	47	50	53	62
Publication Records												
15 Raw Value	91	22	24	4	6	9	11	14	19	23	28	50
Std Value	91	50	10	42	43	45	45	47	49	50	53	62
16 Std Value	91	50	10	42	43	45	46	46	48	50	52	63

NOTE: Standardized values reported in the preceding table have been computed from exact values of the mean and standard deviation and not the rounded values reported here. Since the scale used to compute measure 16 is entirely arbitrary, only data in standardized form are reported for this measure.

TABLE 5.3 Intercorrelations Among Program Measures on 91 Programs in Electrical Engineering

	Measure															
	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16
Program Size																
01		.78	.72	-.04	.06	.15	.06	.73	.68	.24	.78	.46	.27	.63	.84	.83
02			.82	-.09	.18	.10	.06	.76	.75	.11	.81	.47	.39	.58	.84	.85
03				-.05	.17	.04	.07	.68	.65	.11	.74	.47	.33	.62	.79	.81
Program Graduates																
04					-.06	-.02	.10	-.03	.00	-.07	-.08	-.37	.03	.20	-.04	.01
05						-.18	.24	.21	.24	-.05	.21	-.02	.13	.12	.09	.10
06							.41	.13	.08	.10	.17	.04	.17	.08	.18	.19
07								.12	.13	-.02	.14	.02	.27	.30	.11	.14
Survey Results																
08									.98	.23	.94	.56	.56	.59	.78	.80
09										.22	.91	.54	.55	.57	.76	.78
10											.18	.06	.07	.09	.17	.17
11												.52	.59	.62	.82	.84
University Library																
12													.28	.21	.50	.51
Research Support																
13														.21	.48	.52
14															.61	.65
Publication Records																
15																.98
16																

NOTE: Since in computing correlation coefficients program data must be available for both of the measures being correlated, the actual number of programs on which each coefficient is based varies.

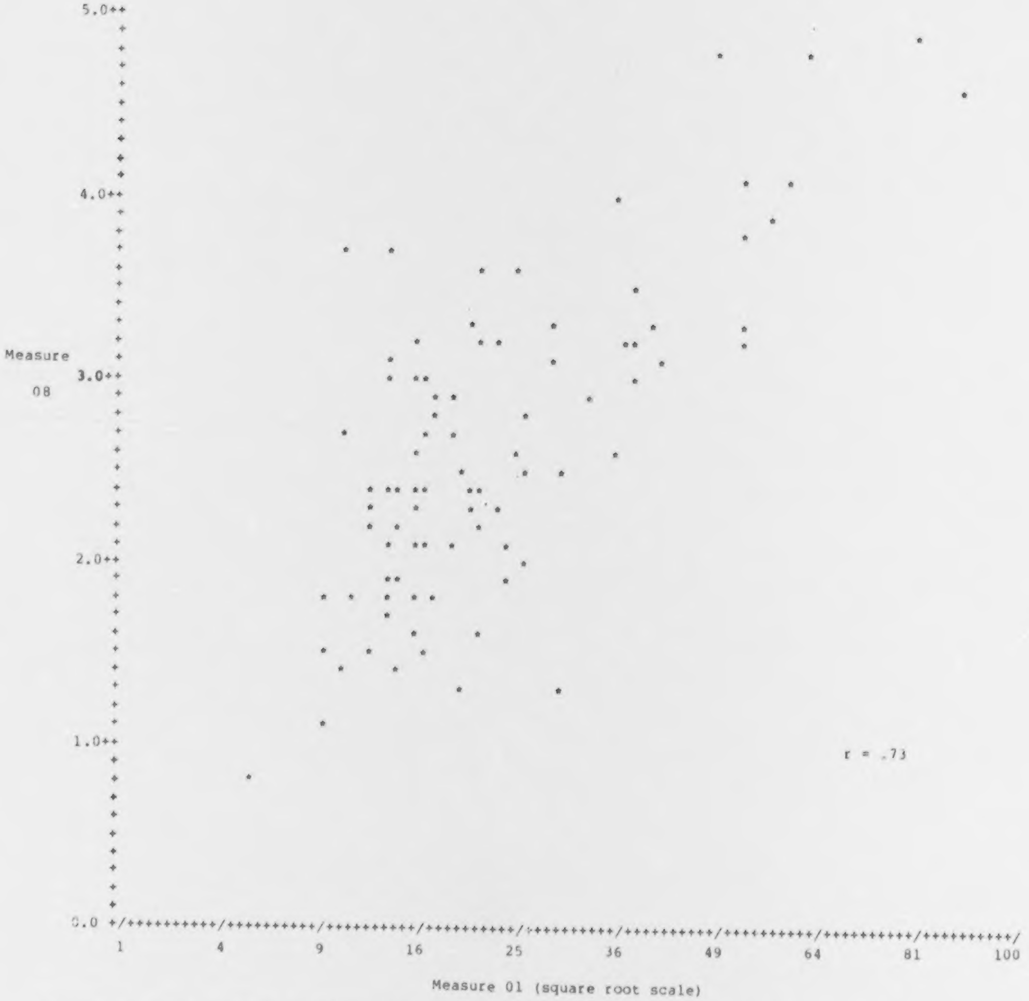

FIGURE 5.1 Mean rating of scholarly quality of faculty (measure 08) versus number of faculty members (measure 01)--90 programs in electrical engineering.

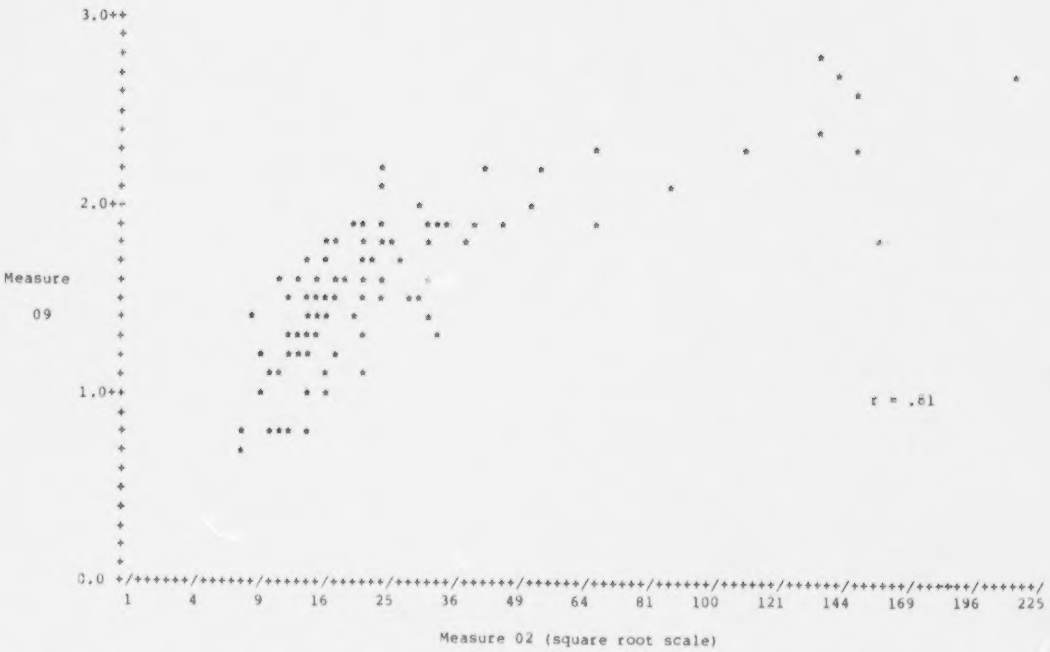

FIGURE 5.2 Mean rating of program effectiveness in educating research scholars/scientists (measure 09) versus number of graduates in last five years (measure 02)--90 programs in electrical engineering.

TABLE 5.4 Characteristics of Survey Participants in Electrical Engineering

	Respondents	
	N	%
Field of Specialization		
Electrical Engineering	106	75
Electronics	13	9
Other/Unknown	23	16
Faculty Rank		
Professor	90	63
Associate Professor	34	24
Assistant Professor	18	13
Year of Highest Degree		
Pre-1950	4	3
1950-59	31	22
1960-69	63	44
Post-1969	42	30
Unknown	2	1
Evaluator Selection		
Nominated by Institution	128	90
Other	14	10
Survey Form		
With Faculty Names	129	91
Without Names	13	9
Total Evaluators	142	100

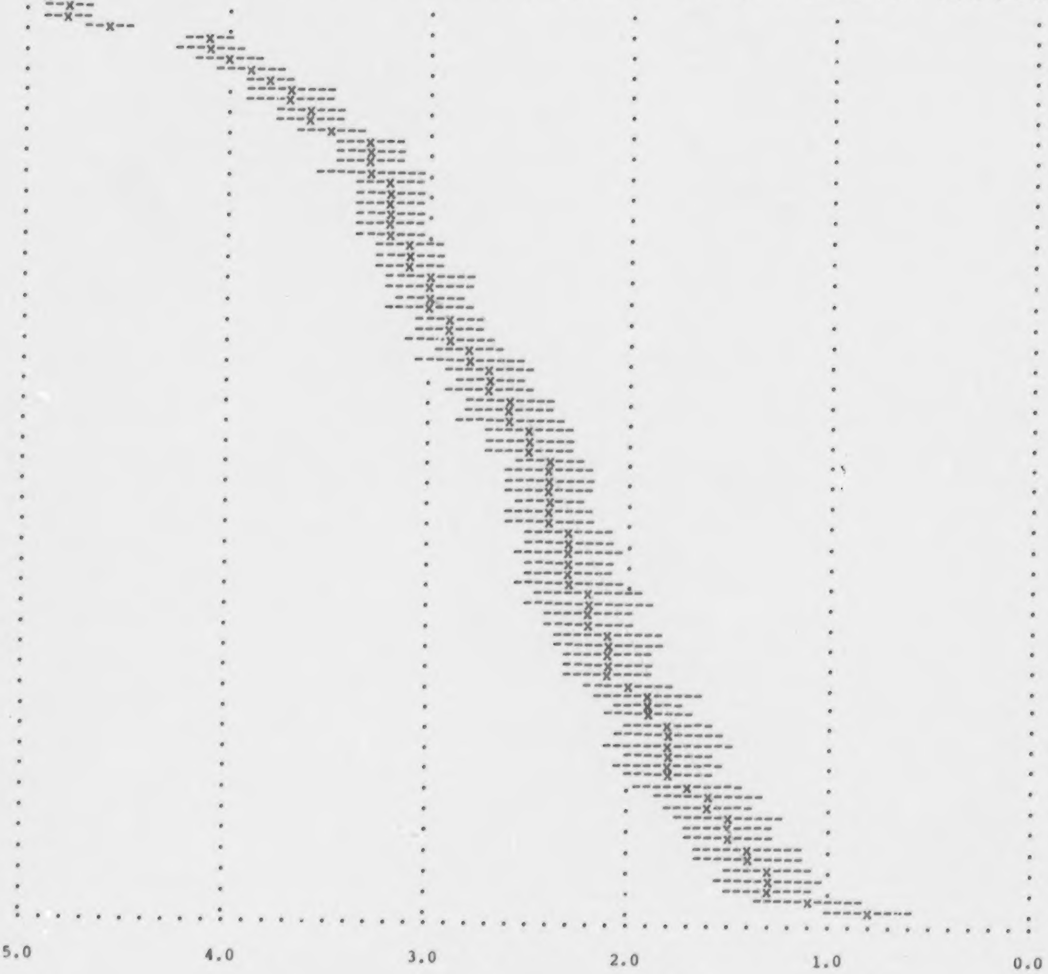

FIGURE 5.3 Mean rating of scholarly quality of faculty in 90 programs in electrical engineering.

NOTE: Programs are listed in sequence of mean rating, with the highest-rated program appearing at the top of the page. The broken lines (---) indicate a confidence interval of ±1.5 standard errors around the reported mean (x) of each program.

VI

Mechanical Engineering Programs

In this chapter 82 research-doctorate programs in mechanical engineering are assessed. These programs, according to the information supplied by their universities, have accounted for 1,683 doctoral degrees awarded during the FY1976-80 period--approximately 88 percent of the aggregate number of mechanical engineering and engineering mechanics doctorates earned from U.S. universities in this five-year span.[1] On the average, 29 full-time and part-time students intending to earn doctorates were enrolled in a program in December 1980, with an average faculty size of 20 members.[2] Most of the 82 programs, listed in Table 6.1, are located in departments of mechanical engineering. Approximately one-fourth are found in departments of mechanical and aerospace engineering. Only three of the programs were initiated since 1970, and no two programs are located in the same university. In addition to the 82 institutions represented in this discipline, another 3 were initially identified as meeting the criteria[3] for inclusion in the assessment:

University of California--San Diego
George Washington University
University of Dayton

The last institution chose not to participate in the assessment in any discipline. Mechanical engineering at the other two institutions have not been included in the evaluations in this discipline, since in each case the study coordinator either indicated that the institution did not at that time have a research-doctorate program in mechanical engineering or failed to provide the information requested by the committee.

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[1] Data from the NRC's Survey of Earned Doctorates indicate that 1,430 research doctorates in mechanical engineering and another 486 research doctorates in engineering mechanics were awarded by U.S. universities between FY1976 and FY1980.

[2] See the reported means for measures 03 and 01 in Table 6.2.

[3] As mentioned in Chapter I, the primary criterion for inclusion was that a university had awarded at least 7 doctorates in mechanical engineering during the FY1976-78 period.

Before examining individual program results presented in Table 6.1, the reader is urged to refer to Chapter II, in which each of the 16 measures used in the assessment is discussed. Summary statistics describing every measure are given in Table 6.2. For 11 of the measures, data are reported for at least 70 of the 82 mechanical engineering programs. For measures 04-07, which pertain to characteristics of the program graduates, data are presented for only approximately 70 percent of the programs; the other 30 percent had too few graduates on which to base statistics.[4] For measure 12, a composite index of the size of a university library, data are available for 59 programs. The programs not evaluated on measure 12 are typically smaller--in terms of faculty size and graduate student enrollment--than other mechanical engineering programs. Were data on this measure available for all 82 programs, it is likely that the reported mean would be appreciably lower (and that some of the correlations of this measure with others would be higher).

Intercorrelations among the 16 measures (Pearson product-moment coefficients) are given in Table 6.3. Of particular note are the high positive correlations of the measures of program size (01-03) with measures of publication records (15, 16) and reputational survey ratings (08, 09). Figure 6.1 illustrates the relation between the mean rating of the scholarly quality of faculty (measure 08) and the number of faculty members (measure 01) for each of 57 programs in mechanical engineering. Figure 6.2 plots the mean rating of program effectiveness (measure 09) against the total number of FY1976-80 program graduates (measure 02). Although in both figures there is a significant positive correlation between program size and reputational rating, it is quite apparent that some of the smaller programs received high mean ratings and that some of the larger programs received low mean ratings.

Table 6.4 describes the 144 faculty members who participated in the evaluation of mechanical engineering programs. These individuals constituted 59 percent of those asked to respond to the survey in this discipline and 9 percent of the faculty population in the 82 research-doctorate programs being evaluated.[5] One-fourth of the survey participants had earned their highest degree since 1970, and a majority held the rank of full professor. Three exceptions should be noted with regard to the survey evaluations in this discipline. The mechanical engineering program at Harvard University was omitted on the survey form since at the time of the survey mailing no information had been provided by the institution. At the request of the study coordinator at Harvard and the department chairman, the program has been included in all other aspects of the assessment. Also, it has been called to the attention of the committee that the Cornell University program in the Department of Mechanical and Aerospace Engineering was incorrectly identified as "Mechanical Engineering and Aerospace Engineering" and that the Johns Hopkins University program in the Department of Mechanics was incorrectly labeled "Mechanical Engineering." The committee has decided to report the survey results for these two programs but cautions that the reputational ratings may have been influenced by the use of inaccurate program titles on the survey form.

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[4] As mentioned in Chapter II, data for measures 04-07 are not reported if they are based on the survey responses of fewer than 10 FY1975-79 program graduates.

[5] See Table 2.3 in Chapter II.

To assist the reader in interpreting results of the survey evaluations, estimated standard errors have been computed for mean ratings of the scholarly quality of faculty in 81 mechanical engineering programs (and are given in Table 6.1). For each program the mean rating and an associated "confidence interval" of 1.5 standard errors are illustrated in Figure 6.3 (listed in order of highest to lowest mean rating). In comparing two programs, if their confidence intervals do not overlap, one may conclude that there is a significant difference in their mean ratings at a .05 level of significance.[6] From this figure it is also apparent that one should have somewhat more confidence in the accuracy of the mean ratings of higher-rated programs than lower-rated programs. This generalization results primarily from the fact that evaluators are not as likely to be familiar with the less prestigious programs, and consequently the mean ratings of these programs are usually based on fewer survey responses.

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[6] See pp. 29-31 for a discussion of the interpretation of mean ratings and associated confidence intervals.

TABLE 6.1 Program Measures (Raw and Standardized Values) in Mechanical Engineering

Prog No.	University - Department/Academic Unit	Program Size			Characteristics of Program Graduates			
		(01)	(02)	(03)	(04)	(05)	(06)	(07)
001.	Akron, University of	11	8	8	NA	NA	NA	NA
	Mechanical Engineering	*42*	*44*	*43*				
002.	Alabama, University of-Tuscaloosa	9	4	5	NA	NA	NA	NA
	Aerospace Engr/ Mechanical Engr/ Mechanics	*40*	*42*	*42*				
003.	Arizona State University-Tempe	19	4	11	NA	NA	NA	NA
	Mechanical and Energy Systems Engineering	*49*	*42*	*44*				
004.	Arizona, University of-Tucson	9	12	13	.50	9.8	.75	.17
	Aerospace and Mechanical Engineering	*40*	*46*	*44*	*75*	*29*	*53*	*50*
005.	Auburn University	19	5	6	NA	NA	NA	NA
	Mechanical Engineering	*49*	*43*	*42*				
006.	Brown University	21	22	30	.19	5.8	.65	.35
	Engineering	*51*	*51*	*50*	*48*	*59*	*45*	*67*
007.	California Institute of Technology	11	13	NA	.42	5.2	.42	.08
	Mechanical Engineering	*42*	*46*		*68*	*64*	*28*	*41*
008.	California, University of-Berkeley	45	133	125	.17	6.0	.67	.19
	Mechanical Engineering	*73*	*99*	*83*	*46*	*58*	*47*	*51*
009.	California, University of-Davis	19	20	29	.00	9.2	.91	.14
	Mechanical Engineering	*49*	*50*	*50*	*31*	*33*	*64*	*47*
010.	California, University of-Los Angeles	34	63	164	.10	7.7	.62	.08
	Engineering and Applied Science	*63*	*70*	*96*	*40*	*44*	*43*	*41*
011.	Carnegie-Mellon University	14	14	32	.38	7.5	.93	.20
	Mechanical Engineering	*45*	*47*	*51*	*64*	*46*	*66*	*53*
012.	Case Western Reserve University	16	12	12	.38	5.8	.81	.38
	Mechanical and Aerospace Engineering	*47*	*46*	*44*	*64*	*59*	*57*	*69*
013.	Catholic University of America	7	20	25	.33	8.8	.73	.09
	Mechanical Engineering	*38*	*50*	*48*	*61*	*37*	*51*	*42*
014.	Cincinnati, University of	16	11	39	NA	NA	NA	NA
	Mechanical Engineering	*47*	*45*	*53*				
015.	Colorado State University-Fort Collins	16	21	12	.16	6.2	.79	.16
	Mechanical Engineering	*47*	*50*	*44*	*45*	*56*	*56*	*49*
016.	Columbia University	7	18	27	.13	7.3	.53	.07
	Mechanical Engineering	*38*	*49*	*49*	*42*	*48*	*36*	*40*
017.	Connecticut, University of-Storrs	16	14	16	.30	8.2	.68	.05
	Mechanical Engineering	*47*	*47*	*45*	*58*	*41*	*48*	*39*
018.	Cornell University-Ithaca	24	22	25	.17	7.0	.78	.33
	Mechanical and Aerospace Engineering	*54*	*51*	*48*	*46*	*50*	*55*	*65*
019.	Delaware, University of-Newark	15	10	49	.30	8.0	.70	.00
	Mechanical and Aerospace Engineering	*46*	*45*	*57*	*58*	*42*	*49*	*34*
020.	Drexel University	18	22	39	.26	6.5	.57	.17
	*Mechanical Engineering and Mechanics**	*48*	*51*	*53*	*54*	*54*	*39*	*50*

* indicates program was initiated since 1970.

NOTE: On the first line of data for every program, raw values for each measure are reported; on the second line values are reported in standardized form, with mean = 50 and standard deviation = 10. "NA" indicates that the value for a measure is not available.

TABLE 6.1 Program Measures (Raw and Standardized Values) in Mechanical Engineering

Prog No.	Survey Results				University Library	Research Support		Published Articles		Survey Ratings Standard Error			
	(08)	(09)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(08)	(09)	(10)	(11)
001.	1.4	1.0	1.1	0.3	NA	.00	NA	3		.18	.13	.13	.05
	33	32	54	37		35		43	44				
002.	1.5	0.9	0.7	0.3	-1.3	NA	NA	2		.14	.10	.11	.05
	34	30	33	38	36			42	41				
003.	2.7	1.5	1.4	0.6	-0.3	.32	NA	5		.12	.08	.12	.07
	49	45	69	48	45	57		44	43				
004.	2.3	1.5	1.2	0.6	0.9	NA	5261	4		.15	.09	.12	.07
	44	46	60	46	56		47	43	44				
005.	1.9	1.3	1.1	0.3	NA	.05	2450	1		.16	.11	.14	.05
	40	41	51	37		39	44	41	42				
006.	3.9	2.3	0.9	1.0	-1.1	.71	3497	15		.12	.08	.06	.08
	64	65	43	60	38	85	45	53	53				
007.	4.3	2.5	0.8	1.1	NA	.27	8339	17		.09	.06	.07	.08
	69	69	37	64		54	51	55	51				
008.	4.6	2.6	1.1	1.5	2.2	.40	16448	54		.07	.06	.07	.06
	73	73	56	76	68	63	60	87	81				
009.	3.0	1.9	1.3	0.7	0.6	.21	3136	9		.09	.07	.09	.07
	53	54	64	51	54	50	45	48	48				
010.	3.9	2.2	1.2	1.1	2.0	.35	6168	13		.09	.06	.07	.07
	64	63	57	65	66	60	48	51	49				
011.	3.1	1.9	1.0	0.9	NA	.43	6409	8		.11	.06	.11	.08
	55	54	51	56		65	48	47	47				
012.	3.1	1.9	0.9	0.9	-1.3	.06	8676	9		.11	.06	.09	.07
	55	54	43	57	36	39	51	48	45				
013.	1.6	1.1	0.7	0.3	NA	NA	NA	3		.14	.11	.11	.05
	36	36	33	36				43	43				
014.	2.1	1.7	1.1	0.4	-0.2	.00	2360	16		.15	.10	.09	.06
	42	49	53	40	46	35	44	54	61				
015.	2.5	1.7	1.0	0.6	-1.1	.13	8604	3		.12	.08	.10	.07
	47	49	50	45	38	44	51	43	43				
016.	3.2	1.8	0.7	0.8	1.7	NA	5375	8		.15	.08	.08	.08
	56	53	32	52	64		47	47	57				
017.	2.2	1.5	0.9	0.5	-0.5	.00	4069	4		.11	.08	.10	.07
	43	45	44	44	44	35	46	43	45				
018.	3.8	2.3	1.1	1.0	1.6	.17	13206	22		.09	.05	.08	.07
	64	64	55	62	63	47	56	59	53				
019.	2.4	1.6	1.3	0.6	NA	.20	3307	6		.12	.08	.09	.06
	45	47	61	46		49	45	45	47				
020.	2.3	1.6	1.1	0.6	NA	.11	2649	1		.13	.09	.07	.07
	44	48	53	46		43	44	41	41				

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TABLE 6.1 Program Measures (Raw and Standardized Values) in Mechanical Engineering

Prog No.	University - Department/Academic Unit	Program Size			Characteristics of Program Graduates			
		(01)	(02)	(03)	(04)	(05)	(06)	(07)
021.	Florida, University of-Gainesville	15	11	51	.25	5.6	.75	.17
	Mechanical Engineering	*46*	*45*	*57*	*53*	*60*	*53*	*50*
022.	Georgia Institute of Technology	16	18	22	.17	7.2	.50	.00
	Mechanical Engineering	*47*	*49*	*47*	*46*	*49*	*34*	*34*
023.	Harvard University	8	17	22	.20	5.3	.80	.40
	Applied Sciences	*39*	*48*	*47*	*49*	*63*	*56*	*71*
024.	Houston, University of	24	18	42	.10	7.5	.80	.30
	Mechanical Engineering	*54*	*49*	*54*	*40*	*46*	*56*	*62*
025.	Illinois Institute of Technology	14	13	17	NA	NA	NA	NA
	Mechanical and Aerospace Engineering	*45*	*46*	*46*				
026.	Illinois, University of-Chicago Circle	27	13	49	NA	NA	NA	NA
	Materials Engineering	*57*	*46*	*57*				
027.	Illinois, University-Urbana/Champaign	43	38	57	.04	7.3	.86	.18
	Mechanical and Industrial Engineering	*71*	*58*	*59*	*35*	*48*	*61*	*51*
028.	Iowa State University-Ames	16	17	12	.27	5.3	NA	NA
	Mechanical Engineering	*47*	*48*	*44*	*55*	*63*		
029.	Iowa, University of-Iowa City	24	30	31	.07	7.3	.41	.22
	Mechanical Engineering	*54*	*55*	*51*	*38*	*47*	*27*	*55*
030.	Johns Hopkins University	3	18	4	NA	5.0	NA	NA
	Mechanics	*35*	*49*	*41*		*65*		
031.	Kansas State University-Manhattan	13	10	16	NA	NA	NA	NA
	Mechanical Engineering	*44*	*45*	*45*				
032.	Kentucky, University of	13	7	14	NA	NA	NA	NA
	Mechanical Engineering	*44*	*44*	*45*				
033.	Lehigh University	29	11	25	.21	5.5	.67	.22
	Mechanical Engineering and Mechanics	*58*	*45*	*48*	*50*	*61*	*46*	*55*
034.	Maryland, University of-College Park	27	20	18	.04	12.8	.91	.09
	Mechanical Engineering	*57*	*50*	*46*	*35*	*6*	*64*	*42*
035.	Massachusetts Institute of Technology	59	107	123	.25	5.6	.67	.24
	Mechanical Engineering	*86*	*92*	*82*	*53*	*61*	*47*	*56*
036.	Massachusetts, University of-Amherst	21	13	8	.24	6.8	.80	.27
	Mechanical Engineering	*51*	*46*	*43*	*52*	*52*	*56*	*59*
037.	Miami, University of-Florida	5	11	14	.00	8.3	.80	.30
	Mechanical Engineering	*37*	*45*	*45*	*31*	*40*	*56*	*62*
038.	Michigan State University-East Lansing	18	12	18	NA	NA	NA	NA
	Mechanical Engineering	*48*	*46*	*46*				
039.	Michigan, University of-Ann Arbor	57	19	38	.28	7.9	.64	.14
	Mechanical Engineering & Applied Mechanics	*84*	*49*	*53*	*56*	*43*	*44*	*47*
040.	Minnesota, University of	24	49	63	.29	6.9	.87	.10
	Mechanical Engineering	*54*	*64*	*62*	*57*	*51*	*62*	*44*

* indicates program was initiated since 1970.

NOTE: On the first line of data for every program, raw values for each measure are reported; on the second line values are reported in standardized form, with mean = 50 and standard deviation = 10. "NA" indicates that the value for a measure is not available.

TABLE 6.1 Program Measures (Raw and Standardized Values) in Mechanical Engineering

Prog No.	Survey Results (08)	(09)	(10)	(11)	University Library (12)	Research Support (13)	(14)	Published Articles (15)	(16)	Survey Ratings Standard Error (08)	(09)	(10)	(11)
021.	2.4	1.6	1.2	0.7	0.8	.33	13686	10		.12	.08	.10	.07
	45	*46*	*60*	*49*	*55*	*58*	*57*	*49*	*48*				
022.	3.0	1.9	1.0	0.9	NA	.31	29270	21		.12	.06	.09	.08
	54	*54*	*50*	*58*		*57*	*74*	*58*	*58*				
023.	NA	NA	NA	NA	3.0	NA	NA	10		NA	NA	NA	NA
					75			*49*	*46*				
024.	2.9	1.7	1.5	0.8	-0.9	.13	5015	13		.12	.08	.09	.08
	52	*50*	*73*	*53*	*40*	*44*	*47*	*51*	*50*				
025.	2.8	1.7	0.7	0.9	NA	.21	NA	11		.11	.06	.08	.07
	50	*50*	*34*	*58*		*50*		*50*	*54*				
026.	2.7	1.8	1.1	0.5	NA	.26	2144	14		.14	.10	.11	.07
	50	*53*	*52*	*44*		*53*	*43*	*52*	*50*				
027.	3.8	2.2	1.2	1.1	2.0	.23	18980	33		.08	.05	.06	.06
	63	*64*	*57*	*65*	*66*	*51*	*63*	*69*	*66*				
028.	3.0	1.8	1.2	0.8	-0.5	.19	8330	13		.10	.06	.07	.07
	53	*53*	*58*	*52*	*44*	*48*	*50*	*51*	*51*				
029.	2.6	1.8	1.2	0.6	0.3	.33	2117	12		.12	.07	.11	.07
	48	*52*	*58*	*46*	*51*	*58*	*43*	*51*	*48*				
030.	3.7	1.7	0.5	0.8	-0.4	NA	1741	3		.19	.10	.08	.08
	62	*49*	*24*	*55*	*45*		*43*	*43*	*43*				
031.	1.9	1.3	0.9	0.4	NA	.08	2604	5		.11	.10	.08	.06
	39	*41*	*41*	*42*		*40*	*44*	*44*	*45*				
032.	2.4	1.4	0.9	0.5	-0.1	.31	5056	22		.12	.10	.11	.06
	46	*43*	*45*	*42*	*47*	*56*	*47*	*59*	*55*				
033.	3.2	2.0	1.2	0.9	NA	.21	4568	13		.10	.08	.08	.08
	56	*57*	*60*	*58*		*49*	*46*	*51*	*51*				
034.	2.7	1.8	1.0	0.6	0.2	.19	3519	15		.11	.06	.09	.06
	49	*51*	*48*	*47*	*50*	*48*	*45*	*53*	*50*				
035.	4.8	2.7	1.0	1.6	-0.3	.42	59143	41		.05	.05	.05	.05
	76	*74*	*51*	*81*	*45*	*65*	*99*	*76*	*70*				
036.	2.4	1.5	1.1	0.5	-0.7	.14	2256	10		.10	.08	.10	.05
	46	*45*	*51*	*45*	*42*	*45*	*44*	*49*	*48*				
037.	1.0	0.9	1.0	0.3	NA	NA	NA	1		.14	.10	.12	.05
	28	*28*	*46*	*36*				*41*	*42*				
038.	2.7	1.7	1.1	0.6	0.3	.39	2247	8		.12	.08	.09	.07
	49	*49*	*56*	*48*	*51*	*62*	*44*	*47*	*46*				
039.	4.0	2.2	0.8	1.2	1.8	.11	19835	17		.08	.06	.09	.07
	65	*63*	*41*	*66*	*64*	*42*	*64*	*55*	*54*				
040.	4.1	2.4	1.0	1.2	1.2	.33	8726	59		.09	.06	.07	.08
	68	*67*	*51*	*66*	*59*	*58*	*51*	*92*	*82*				

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TABLE 6.1 Program Measures (Raw and Standardized Values) in Mechanical Engineering

Prog No.	University - Department/Academic Unit	Program Size			Characteristics of Program Graduates			
		(01)	(02)	(03)	(04)	(05)	(06)	(07)
041.	Missouri, University of-Columbia	8	12	3	.29	5.2	.64	.14
	Mechanical and Aerospace Engineering	*39*	*46*	*41*	*57*	*64*	*45*	*47*
042.	Missouri, University of-Rolla	22	9	9	.38	6.3	.80	.13
	Mechanical and Aerospace Engineering	*52*	*44*	*43*	*64*	*55*	*56*	*46*
043.	New Jersey Institute of Technology	24	10	NA	.20	NA	NA	NA
	Mechanical Engineering	*54*	*45*		*49*			
044.	New Mexico, University of-Albuquerque	10	9	NA	.08	7.8	.75	.17
	Mechanical Engineering	*41*	*44*		*38*	*44*	*53*	*50*
045.	North Carolina State University-Raleigh	27	45	40	.24	7.7	.67	.15
	Mechanical and Aerospace Engineering	*57*	*62*	*54*	*52*	*45*	*46*	*48*
046.	Northwestern University	25	10	23	.15	5.8	.67	.33
	Mechanical and Nuclear Engineering	*55*	*45*	*48*	*45*	*59*	*46*	*65*
047.	Notre Dame, University of	11	10	5	.15	6.8	.75	.08
	Aerospace and Mechanical Engineering	*42*	*45*	*42*	*45*	*51*	*53*	*42*
048.	Ohio State University-Columbus	23	20	49	.15	7.8	.78	.15
	Mechanical Engineering	*53*	*50*	*57*	*44*	*44*	*55*	*48*
049.	Oklahoma State University-Stillwater	17	27	20	.09	6.8	.77	.36
	Mechanical and Aerospace Engineering	*47*	*53*	*47*	*39*	*52*	*54*	*68*
050.	Oklahoma, University of-Norman	18	7	12	NA	NA	NA	NA
	Aerospace, Mechanical, and Nuclear Engin	*48*	*44*	*44*				
051.	Old Dominion University	16	8	25	NA	NA	NA	NA
	*Mechanical Engineering and Mechanics**	*47*	*44*	*48*				
052.	Oregon State University-Corvallis	14	12	20	.17	6.8	.58	.08
	Mechanical Engineering	*45*	*46*	*47*	*46*	*52*	*40*	*42*
053.	Pennsylvania State University	23	19	13	.26	6.8	.75	.30
	Mechanical Engineering	*53*	*49*	*44*	*55*	*51*	*53*	*62*
054.	Pennsylvania, University of	12	19	24	.38	7.3	.80	.07
	Mechanical Engineering & Applied Mechanics	*43*	*49*	*48*	*64*	*47*	*56*	*40*
055.	Pittsburgh, University of	10	9	17	.20	8.5	.90	.10
	Mechanical Engineering	*41*	*44*	*46*	*49*	*38*	*64*	*43*
056.	Polytech Institute of New York	15	10	10	.29	7.3	.60	.00
	Mechanical and Aerospace Engineering	*46*	*45*	*43*	*57*	*48*	*41*	*34*
057.	Princeton University	26	47	51	.29	6.0	.86	.28
	Mechanical and Aerospace Engineering	*56*	*63*	*57*	*57*	*57*	*61*	*60*
058.	Purdue University-West Lafayette	45	75	59	.19	5.9	.77	.23
	Mechanical Engineering	*73*	*76*	*60*	*48*	*58*	*54*	*56*
059.	Rensselaer Polytechnic Institute	39	23	64	.05	7.0	.80	.30
	Mechanical, Aeronautical Engin, & Mechanics	*67*	*51*	*62*	*36*	*50*	*56*	*62*
060.	Rhode Island, University of	16	7	6	NA	NA	NA	NA
	Mechanical Engineering	*47*	*44*	*42*				

* indicates program was initiated since 1970.

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TABLE 6.1 Program Measures (Raw and Standardized Values) in Mechanical Engineering

Prog No.	Survey Results				University Library	Research Support		Published Articles		Survey Ratings Standard Error			
	(08)	(09)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(08)	(09)	(10)	(11)
041.	1.7	1.2	0.9	0.4	-0.2	NA	1976	7		.14	.11	.09	.06
	37	*37*	*41*	*41*	*46*		*43*	*46*	*47*				
042.	2.4	1.5	1.0	0.5	NA	.32	3606	14		.11	.09	.08	.06
	46	*45*	*49*	*42*		*57*	*45*	*52*	*53*				
043.	1.6	1.1	1.0	0.4	NA	.08	NA	0		.13	.09	.09	.07
	35	*35*	*49*	*42*		*41*		*40*	*41*				
044.	1.4	1.0	1.1	0.2	-1.0	.10	6575	6		.16	.12	.08	.05
	33	*32*	*55*	*35*	*39*	*42*	*48*	*45*	*45*				
045.	3.0	1.8	1.2	0.6	NA	.11	8416	12		.12	.06	.08	.07
	53	*52*	*58*	*48*		*43*	*51*	*51*	*49*				
046.	3.5	2.0	1.2	1.1	0.3	.40	5170	36		.10	.06	.08	.08
	60	*58*	*58*	*64*	*51*	*63*	*47*	*72*	*71*				
047.	2.7	1.7	0.9	0.8	-1.3	.36	1544	7		.12	.08	.07	.07
	49	*51*	*45*	*53*	*36*	*60*	*43*	*46*	*46*				
048.	3.0	1.8	1.1	0.8	0.9	.13	10926	17		.12	.06	.08	.07
	53	*53*	*52*	*55*	*56*	*44*	*53*	*55*	*55*				
049.	2.7	1.7	1.1	0.7	-1.9	.06	4120	5		.11	.08	.10	.07
	49	*49*	*51*	*50*	*30*	*39*	*46*	*44*	*41*				
050.	2.4	1.3	0.9	0.7	-0.6	.11	1834	3		.13	.10	.10	.08
	46	*41*	*46*	*49*	*43*	*43*	*43*	*43*	*42*				
051.	1.8	1.2	1.1	0.3	NA	.13	NA	3		.18	.12	.10	.05
	39	*37*	*56*	*36*		*44*		*43*	*48*				
052.	2.3	1.6	1.0	0.5	NA	.07	3128	4		.14	.09	.08	.07
	44	*48*	*50*	*43*		*40*	*45*	*43*	*43*				
053.	2.9	1.9	0.9	0.8	0.7	.17	22901	20		.10	.05	.08	.07
	52	*54*	*42*	*53*	*55*	*47*	*67*	*58*	*66*				
054.	3.1	1.9	1.4	0.7	0.7	.25	4579	4		.12	.05	.09	.07
	55	*55*	*66*	*52*	*54*	*52*	*46*	*43*	*44*				
055.	1.8	1.3	0.8	0.3	0.1	.10	2794	5		.14	.10	.09	.05
	38	*40*	*36*	*38*	*49*	*42*	*44*	*44*	*45*				
056.	2.6	1.6	0.5	0.6	NA	.07	5310	4		.14	.10	.09	.07
	48	*47*	*23*	*46*		*40*	*47*	*43*	*44*				
057.	4.0	2.4	1.2	1.1	0.9	.35	6358	17		.10	.06	.08	.08
	66	*69*	*59*	*65*	*56*	*59*	*48*	*55*	*50*				
058.	3.9	2.3	1.0	1.2	-0.5	.20	17331	35		.09	.05	.06	.07
	65	*66*	*49*	*69*	*43*	*49*	*61*	*71*	*66*				
059.	3.4	2.1	1.4	0.9	NA	.21	7849	31		.09	.06	.07	.07
	58	*59*	*66*	*58*		*49*	*50*	*67*	*83*				
060.	2.2	1.3	1.4	0.5	NA	.19	2611	4		.15	.10	.10	.06
	43	*41*	*66*	*43*		*48*	*44*	*43*	*43*				

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TABLE 6.1 Program Measures (Raw and Standardized Values) in Mechanical Engineering

Prog No.	University - Department/Academic Unit	Program Size			Characteristics of Program Graduates			
		(01)	(02)	(03)	(04)	(05)	(06)	(07)
061.	Rice University	14	20	14	.19	5.4	.75	.06
	Mechanical Engineering and Materials Sci	*45*	*50*	*45*	*48*	*62*	*53*	*40*
062.	Rochester, University of	16	27	32	.11	6.6	.78	.17
	Mechanical and Aerospace Sciences	*47*	*53*	*51*	*41*	*53*	*55*	*50*
063.	Rutgers, The State University-New Brunswick	14	5	82	NA	NA	NA	NA
	Mechanical and Aerospace Engineering	*45*	*43*	*68*				
064.	SUNY at Buffalo	21	13	12	.09	NA	.80	.10
	Mechanical and Aerospace Engineering	*51*	*46*	*44*	*39*		*56*	*43*
065.	SUNY at Stony Brook	15	22	33	.05	7.2	.38	.00
	Mechanical Engineering	*46*	*51*	*51*	*35*	*48*	*25*	*34*
066.	Southern California, University of	10	9	8	NA	NA	NA	NA
	Mechanical Engineering	*41*	*44*	*43*				
067.	Stanford University	36	54	107	.30	6.1	.82	.19
	Mechanical Engineering	*65*	*66*	*77*	*58*	*57*	*57*	*51*
068.	Stevens Institute of Technology	16	6	10	NA	NA	NA	NA
	Mechanical Engineering	*47*	*43*	*43*				
069.	Syracuse University	7	14	1	.29	7.5	.69	.23
	Mechanical and Aerospace Engineering	*38*	*47*	*40*	*57*	*46*	*48*	*55*
070.	Tennessee, University of-Knoxville	19	14	17	.08	6.5	.50	.08
	Mechanical and Aerospace Engineering	*49*	*47*	*46*	*39*	*54*	*34*	*42*
071.	Tennessee, University of-Space Institute	13	10	16	NA	NA	NA	NA
	Mechanical & Aerospace Engineering	*44*	*45*	*45*				
072.	Texas A & M University	34	15	18	NA	NA	NA	NA
	Mechanical Engineering	*63*	*47*	*46*				
073.	Texas, University of-Austin	35	42	55	.20	7.3	.61	.10
	Mechanical Engineering	*64*	*60*	*59*	*49*	*47*	*42*	*43*
074.	Tulane University	6	9	7	NA	NA	NA	NA
	Mechanical Engineering	*37*	*44*	*42*				
075.	Vanderbilt University	10	10	9	NA	NA	NA	NA
	Mechanical and Materials Engineering	*41*	*45*	*43*				
076.	Virginia Polytechnic Institute & State Univ	28	12	23	.39	6.0	.92	.00
	Mechanical Engineering	*57*	*46*	*48*	*65*	*57*	*66*	*34*
077.	Virginia, University of	24	12	15	.46	6.8	.64	.27
	Mechanical and Aerospace Engineering	*54*	*46*	*45*	*71*	*52*	*44*	*59*
078.	Washington University-Saint Louis	12	11	13	NA	NA	NA	NA
	Mechanical Engineering	*43*	*45*	*44*				
079.	Washington, University of-Seattle	33	12	17	.19	8.0	.81	.25
	Mechanical Engineering	*62*	*46*	*46*	*48*	*42*	*57*	*57*
080.	Wayne State University	15	19	13	.24	8.8	.38	.06
	Mechanical Engineering	*46*	*49*	*44*	*52*	*37*	*25*	*40*

* indicates program was initiated since 1970.

NOTE: On the first line of data for every program, raw values for each measure are reported; on the second line values are reported in standardized form, with mean = 50 and standard deviation = 10. "NA" indicates that the value for a measure is not available.

TABLE 6.1 Program Measures (Raw and Standardized Values) in Mechanical Engineering

Prog No.	Survey Results				University Library	Research Support		Published Articles		Survey Ratings Standard Error			
	(08)	(09)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(08)	(09)	(10)	(11)
061.	3.0	1.8	1.1	0.6	-1.4	.43	1782	5		.12	.08	.08	.06
	53	*53*	*51*	*48*	*35*	*65*	*43*	*44*	*44*				
062.	2.6	1.7	1.0	0.4	-0.6	.19	16764	5		.17	.09	.12	.06
	49	*49*	*51*	*42*	*42*	*48*	*60*	*44*	*44*				
063.	2.5	1.6	0.8	0.6	0.8	.21	1877	5		.12	.08	.12	.06
	47	*46*	*38*	*47*	*55*	*50*	*43*	*44*	*44*				
064.	2.6	1.6	0.9	0.6	0.3	.24	3019	17		.13	.09	.12	.07
	48	*48*	*41*	*46*	*51*	*52*	*44*	*55*	*55*				
065.	2.9	1.8	0.9	0.5	-0.6	.53	1539	1		.13	.09	.13	.06
	51	*52*	*45*	*45*	*42*	*72*	*43*	*41*	*41*				
066.	2.4	1.5	1.0	0.5	0.4	.30	18269	6		.15	.08	.06	.06
	45	*45*	*50*	*44*	*51*	*56*	*62*	*45*	*45*				
067.	4.6	2.7	1.1	1.6	2.0	.47	25196	13		.07	.05	.04	.06
	74	*75*	*52*	*79*	*67*	*68*	*70*	*51*	*49*				
068.	2.0	1.2	0.9	0.4	NA	.13	2313	2		.14	.11	.11	.06
	41	*38*	*44*	*42*		*44*	*44*	*42*	*41*				
069.	2.1	1.4	0.8	0.5	-0.3	NA	4063	2		.15	.10	.07	.06
	42	*41*	*39*	*42*	*45*		*46*	*42*	*42*				
070.	2.1	1.4	0.9	0.4	-0.4	.05	4266	1		.12	.09	.08	.05
	42	*42*	*45*	*40*	*44*	*39*	*46*	*41*	*42*				
071.	1.8	1.4	0.8	0.3	NA	.00	NA	0		.16	.10	.11	.06
	39	*43*	*41*	*37*		*35*		*40*	*41*				
072.	2.4	1.5	1.3	0.7	-0.5	.03	18988	10		.13	.08	.08	.06
	46	*45*	*63*	*49*	*44*	*37*	*63*	*49*	*55*				
073.	3.3	2.0	1.4	0.8	1.6	.23	10517	19		.10	.07	.08	.08
	57	*57*	*69*	*54*	*63*	*51*	*53*	*57*	*57*				
074.	1.9	1.2	0.7	0.5	-1.0	NA	NA	3		.17	.10	.13	.06
	39	*38*	*36*	*43*	*39*			*43*	*41*				
075.	2.0	1.5	1.0	0.4	-0.7	.20	NA	5		.18	.13	.09	.06
	41	*46*	*51*	*41*	*42*	*49*		*44*	*44*				
076.	3.0	1.9	1.2	0.6	-0.0	.07	7243	17		.12	.07	.08	.07
	53	*54*	*58*	*48*	*48*	*40*	*49*	*55*	*56*				
077.	2.6	1.9	1.3	0.7	0.7	.13	4673	14		.12	.06	.09	.07
	49	*54*	*61*	*50*	*55*	*44*	*46*	*52*	*80*				
078.	2.4	1.5	1.2	0.4	-0.4	.42	5257	2		.15	.09	.10	.06
	46	*45*	*57*	*42*	*45*	*64*	*47*	*42*	*41*				
079.	3.1	1.8	0.8	0.8	1.5	.09	5430	6		.11	.09	.08	.07
	54	*51*	*40*	*53*	*61*	*41*	*47*	*45*	*44*				
080.	2.2	1.4	1.2	0.4	-0.4	.40	2693	3		.13	.11	.12	.06
	44	*43*	*57*	*42*	*45*	*63*	*44*	*43*	*43*				

NOTE: On the first line of data for every program, raw values for each measure are reported; on the second line values are reported in standardized form, with mean = 50 and standard deviation = 10. "NA" indicates that the value for a measure is not available. Since the scale used to compute measure 16 is entirely arbitrary, only values in standardized form are reported for this measure.

TABLE 6.1 Program Measures (Raw and Standardized Values) in Mechanical Engineering

Prog No.	University - Department/Academic Unit	Program Size (01)	Program Size (02)	Program Size (03)	Characteristics of Program Graduates (04)	Characteristics of Program Graduates (05)	Characteristics of Program Graduates (06)	Characteristics of Program Graduates (07)
081.	Wisconsin, University of-Madison	32	53	54	.15	6.3	.75	.34
	Mechanical Engineering	*61*	*66*	*58*	*45*	*55*	*52*	*66*
082.	Yale University	9	6	13	NA	NA	NA	NA
	Engineering and Applied Science	*40*	*43*	*44*				

* indicates program was initiated since 1970.

NOTE: On the first line of data for every program, raw values for each measure are reported; on the second line values are reported in standardized form, with mean = 50 and standard deviation = 10. "NA" indicates that the value for a measure is not available.

TABLE 6.1 Program Measures (Raw and Standardized Values) in Mechanical Engineering

Prog No.	Survey Results (08)	(09)	(10)	(11)	University Library (12)	Research Support (13)	(14)	Published Articles (15)	(16)	Survey Ratings Standard Error (08)	(09)	(10)	(11)
081.	3.5	2.1	1.0	1.0	1.6	.22	9919	28		.11	.06	.07	.07
	60	*61*	*51*	*62*	*62*	*50*	*52*	*65*	*54*				
082.	3.1	1.7	0.8	0.8	2.1	NA	2510	5		.15	.08	.08	.07
	54	*49*	*40*	*55*	*67*		*44*	*44*	*43*				

NOTE: On the first line of data for every program, raw values for each measure are reported; on the second line values are reported in standardized form, with mean = 50 and standard deviation = 10. "NA" indicates that the value for a measure is not available. Since the scale used to compute measure 16 is entirely arbitrary, only values in standardized form are reported for this measure.

TABLE 6.2 Summary Statistics Describing Each Program Measure--Mechanical Engineering

Measure	Number of Programs Evaluated	Mean	Standard Deviation	DECILES								
				1	2	3	4	5	6	7	8	9
Program Size												
01 Raw Value	82	20	11	8	11	14	15	16	19	23	27	34
Std Value	82	50	10	39	42	45	46	47	49	53	57	63
02 Raw Value	82	21	21	7	9	11	12	13	17	19	22	44
Std Value	82	50	10	44	44	45	46	46	48	49	51	61
03 Raw Value	79	29	29	7	11	13	16	18	24	31	43	57
Std Value	79	50	10	42	44	44	45	46	48	51	55	59
Program Graduates												
04 Raw Value	59	.21	.11	.05	.10	.15	.17	.20	.24	.28	.29	.38
Std Value	59	50	10	35	40	45	46	49	53	56	57	65
05 Raw Value	58	7.0	1.3	8.6	7.8	7.5	7.3	6.9	6.8	6.2	5.9	5.5
Std Value	58	50	10	38	44	46	48	51	51	56	58	61
06 Raw Value	57	.71	.13	.50	.61	.67	.69	.75	.77	.80	.80	.87
Std Value	57	50	10	34	42	47	48	53	55	57	57	62
07 Raw Value	57	.17	.11	.04	.08	.09	.14	.16	.18	.23	.28	.33
Std Value	57	50	10	38	42	43	47	49	51	55	60	65
Survey Results												
08 Raw Value	81	2.7	.8	1.8	2.1	2.3	2.4	2.7	2.9	3.0	3.3	3.9
Std Value	81	50	10	38	42	44	46	50	52	53	57	65
09 Raw Value	81	1.7	.4	1.2	1.4	1.5	1.6	1.7	1.8	1.9	2.0	2.3
Std Value	81	50	10	38	43	45	48	50	53	55	58	65
10 Raw Value	81	1.0	.2	.8	.9	.9	1.0	1.0	1.1	1.1	1.2	1.3
Std Value	81	50	10	39	44	44	49	49	54	54	59	64
11 Raw Value	81	.7	.3	.3	.4	.5	.6	.6	.7	.8	.9	1.1
Std Value	81	50	10	37	40	44	47	47	50	54	57	64
University Library												
12 Raw Value	59	.2	1.1	-1.3	-.7	-.5	-.4	-.1	.3	.8	1.2	1.8
Std Value	59	50	10	36	42	44	44	47	51	55	59	64
Research Support												
13 Raw Value	71	.22	.14	.05	.09	.12	.15	.20	.22	.29	.33	.40
Std Value	71	50	10	38	41	43	45	49	50	55	58	63
14 Raw Value	70	7893	8769	1976	2450	3019	4063	5015	5430	8330	10517	18269
Std Value	70	50	10	43	44	44	46	47	47	50	53	62
Publication Records												
15 Raw Value	82	11	11	2	3	4	5	8	10	13	17	22
Std Value	82	50	10	42	43	43	44	47	49	51	55	59
16 Std Value	82	50	10	41	43	44	45	47	49	51	55	65

NOTE: Standardized values reported in the preceding table have been computed from exact values of the mean and standard deviation and not the rounded values reported here. Since the scale used to compute measure 16 is entirely arbitrary, only data in standardized form are reported for this measure.

TABLE 6.3 Intercorrelations Among Program Measures on 82 Programs in Mechanical Engineering

	Measure															
	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16
Program Size																
01		.66	.64	-.12	.06	.09	.18	.65	.67	.34	.69	.35	.11	.60	.55	.59
02			.78	-.11	.17	-.01	.12	.67	.68	.17	.70	.32	.33	.58	.69	.52
03				-.14	.09	-.01	.01	.64	.67	.25	.67	.46	.33	.46	.56	.45
Program Graduates																
04					.20	.03	-.09	.08	.09	-.08	.07	.07	-.03	.04	-.05	.02
05						-.14	.29	.37	.33	-.05	.35	-.10	.23	.19	.21	.18
06							.30	.03	.03	.16	.08	.06	-.19	.03	.16	.10
07								.19	.20	.19	.29	.04	.02	.13	.21	.20
Survey Results																
08									.97	.14	.95	.52	.52	.52	.70	.57
09										.21	.92	.52	.50	.52	.71	.61
10											.13	.12	.11	.07	.22	.24
11												.51	.45	.61	.73	.60
University Library																
12													.10	.20	.38	.36
Research Support																
13														.16	.31	.19
14															.49	.42
Publication Records																
15																.88
16																

NOTE: Since in computing correlation coefficients program data must be available for both of the measures being correlated, the actual number of programs on which each coefficient is based varies.

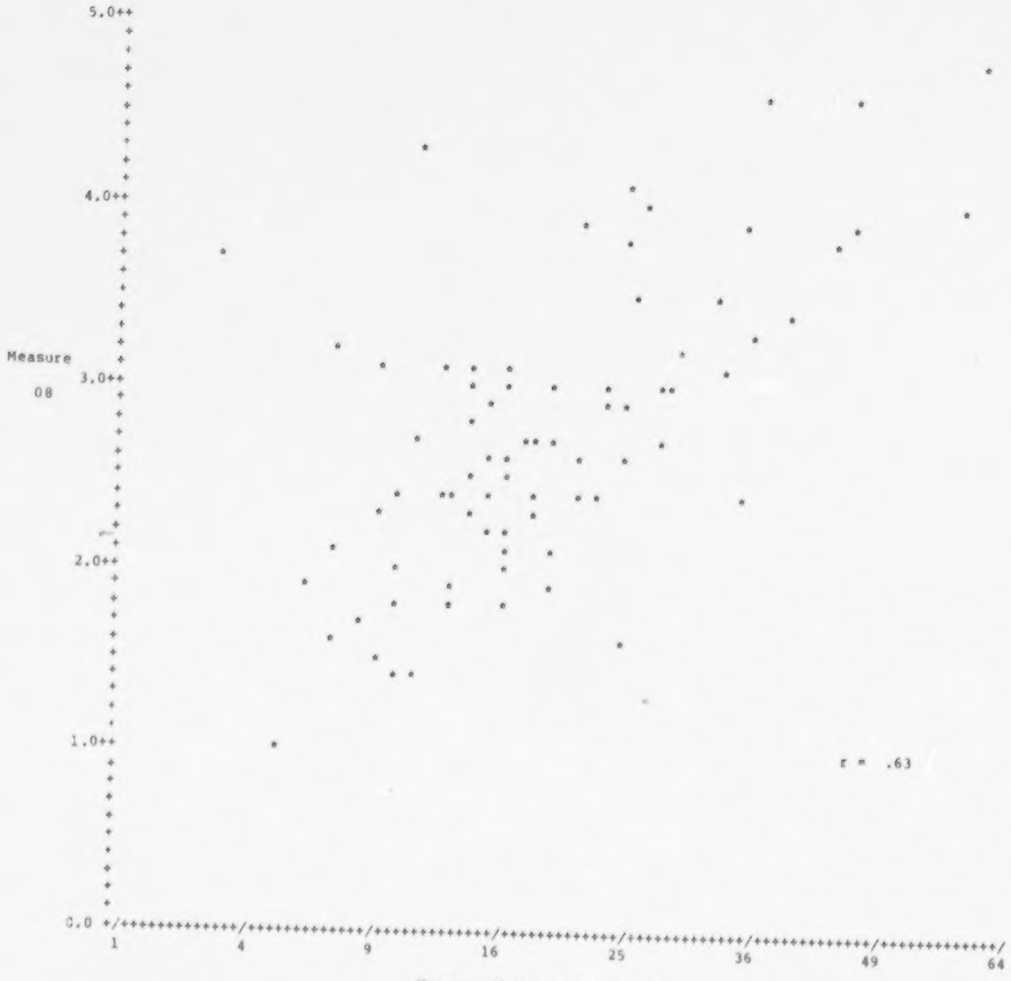
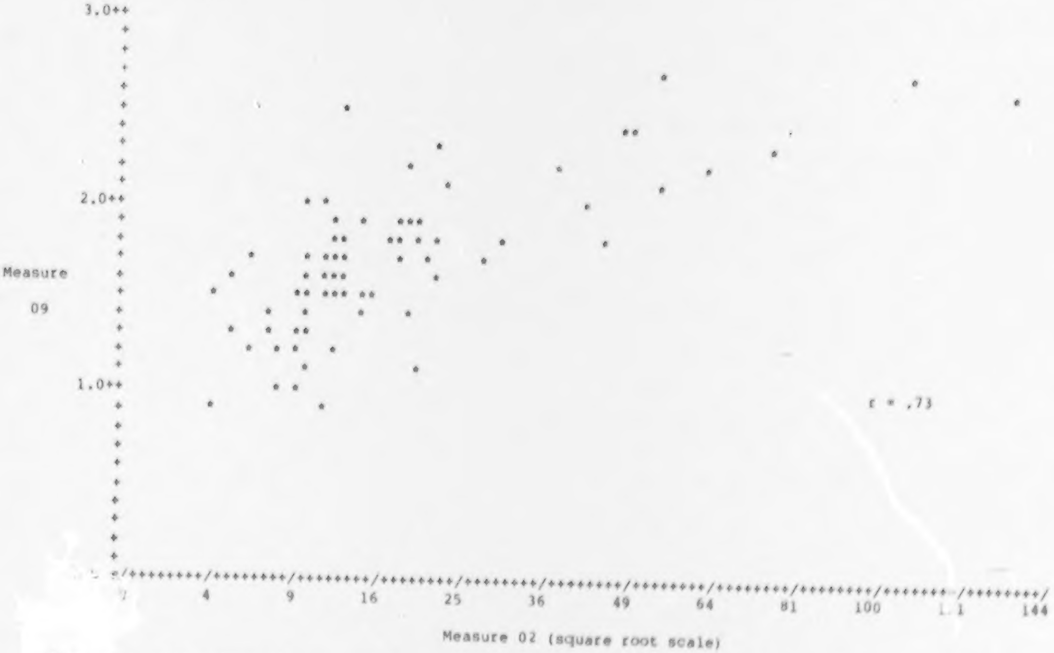


FIGURE 6.1 Mean rating of scholarly quality of faculty (measure 08) versus number of faculty members (measure 01)--81 programs in mechanical engineering.



[illegible] 2 Mean rating of program effectiveness in educating research scholars/scientists (measure 09) versus number of graduates in last five years (measure 02)--81 programs in mechanical engineering.

TABLE 6.4 Characteristics of Survey Participants in Mechanical Engineering

	Respondents	
	N	%
Field of Specialization		
Engineering Mechanics	15	10
Mechanical Engineering	114	79
Other/Unknown	15	10
Faculty Rank		
Professor	99	69
Associate Professor	30	21
Assistant Professor	15	10
Year of Highest Degree		
Pre-1950	5	4
1950-59	24	17
1960-69	79	55
Post-1969	36	25
Evaluator Selection		
Nominated by Institution	132	92
Other	12	8
Survey Form		
With Faculty Names	127	88
Without Names	17	12
Total Evaluators	144	100

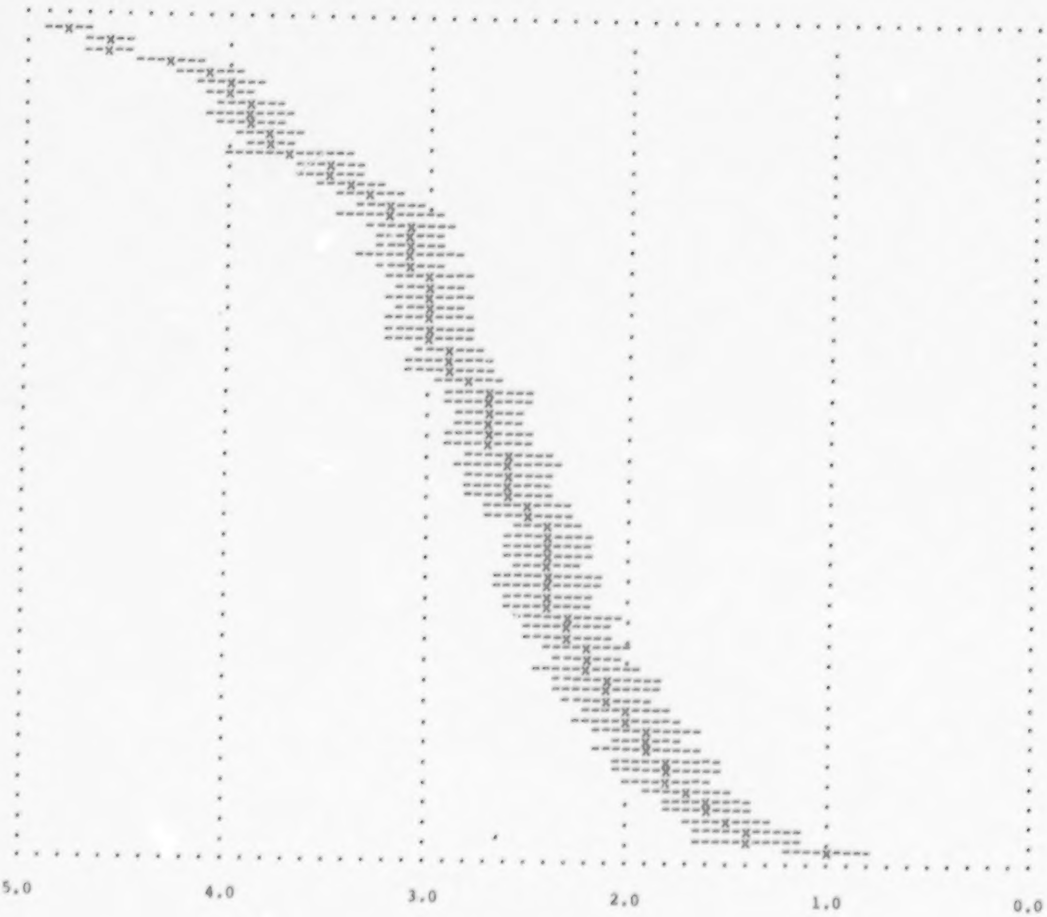


FIGURE 6.3 Mean rating of scholarly quality of faculty in 81 programs in mechanical engineering.

NOTE: Programs are listed in sequence of mean rating, with the highest-rated program appearing at the top of the page. The broken lines (---) indicate a confidence interval of ±1.5 standard errors around the reported mean (x) of each program.

VII
Summary and Discussion

In the four preceding chapters results are presented of the assessment of 326 research-doctorate programs in chemical engineering, civil engineering, electrical engineering, and mechanical engineering. Included in each chapter are summary data describing the means and intercorrelations of the program measures in a particular discipline. In this chapter a comparison is made of the summary data reported in the four disciplines. Also presented here are an analysis of the reliability (consistency) of the reputational survey ratings and an examination of some factors that might possibly have influenced the survey results. This chapter concludes with suggestions for improving studies of this kind--with particular attention given to the types of measures one would like to have available for an assessment of research-doctorate programs.

This chapter necessarily involves a detailed discussion of various statistics (means, standard deviations, correlation coefficients) describing the measures. Throughout, the reader should bear in mind that all these statistics and measures are necessarily imperfect attempts to describe the real quality of research-doctorate programs. Quality and some differences in quality are real, but these differences cannot be subsumed completely under any one quantitative measure. For example, no single numerical ranking--by measure 08 or by any weighted average of measures--can rank the quality of different programs with precision.

However, the evidence for reliability indicates considerable stability in the assessment of quality. For instance, a program that comes out in the first decile of a ranking is quite unlikely to "really" belong in the third decile, or vice versa. If numerical ranks of programs were replaced by groupings (distinguished, strong, etc.), these groupings again would not fully capture actual differences in quality since there would likely be substantial ambiguity about the borderline between adjacent groups. Furthermore, any attempt at linear ordering (best, next best, . . .) may also be inaccurate. Programs of roughly comparable quality may be better in different ways, so that there simply is no one best--as will also be indicated in some of the numerical analyses. However, these difficulties of formulating ranks should not hide the underlying reality of differences in quality or the importance of high quality for effective doctoral education.

SUMMARY OF THE RESULTS

Displayed in Table 7.1 are the numbers of programs evaluated (bottom line) and the mean values for each measure in the four engineering disciplines.[1] As can be seen, the mean values reported for individual measures vary considerably among disciplines. The pattern of means on each measure is summarized below, but the reader interested in a detailed comparison of the distribution of a measure may wish to refer to the second table in each of the four preceding chapters.[2]

Program Size (Measures 01-03). Based on the information provided to the committee by the study coordinator at each university, electrical engineering programs had, on the average, the largest number of faculty members (23 in December 1980), followed by civil (20) and mechanical engineering (20). Electrical engineering programs also graduated the most students (32 Ph.D. recipients in the FY1975-79 period) and had the largest enrollment (49 doctoral students in December 1980). In contrast, chemical engineering programs were reported to have an average of only 12 faculty members, 18 graduates, and 24 doctoral students.

Program Graduates (Measures 04-07). The mean fraction of FY1975-79 doctoral recipients who as graduate students had received some national fellowship or training grant support (measure 04) ranges from .13 for graduates of civil engineering programs to .25 for graduates in chemical engineering. With respect to the median number of years from first enrollment in a graduate program to receipt of the doctorate (measure 05), chemical engineering graduates typically earned their degrees almost a full year sooner than graduates in any other discipline. In terms of employment status at graduation (measure 06), an average of 78 percent of the Ph.D. recipients from chemical engineering programs reported that they had made firm job commitments by the time they had completed requirements for their degree, contrasted with 69-71 percent of the program graduates in the other engineering disciplines. A mean of only 15-19 percent of the graduates in the four engineering disciplines reported that they had made firm commitments to take positions in Ph.D.-granting institutions (measure 07). This low percentage (compared with the humanities and many of the science disciplines) reflects the availability of employment opportunities for engineers outside the academic sector.

Survey Results (Measures 08-11). Differences in the mean ratings derived from the reputational survey are small. In all four disciplines the mean rating of scholarly quality of program faculty (measure 08)

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[1] Means for measure 16, "influence" of publication, are omitted since arbitrary scaling of this measure prevents meaningful comparisons across disciplines.

[2] The second table in each of the four preceding chapters presents the standard deviation and decile values for each measure.

TABLE 7.1 Mean Values for Each Program Measure, by Discipline

	Chemical Engin.	Civil Engin.	Electrical Engin.	Mechanical Engin.
Program Size				
01	12	20	23	20
02	18	22	32	21
03	24	35	49	29
Program Graduates				
04	.25	.13	.19	.21
05	5.9	6.9	6.7	7.0
06	.78	.69	.70	.71
07	.15	.19	.17	.17
Survey Results				
08	2.7	2.7	2.6	2.7
09	1.6	1.6	1.6	1.7
10	1.1	1.0	1.1	1.0
11	.9	.7	.7	.7
University Library				
12	.2	.2	.2	.2
Research Support				
13	.37	.20	.27	.22
14	7819	7998	7679	7893
Publication Records				
15	10	12	22	11
Total Programs	79	74	91	82

is slightly below 3.0 ("good"), and programs were judged to be, on the average, a bit below "moderately" effective (2.0) in educating research scholars/scientists (measure 09). In the opinions of the survey respondents, there has been "little or no change" (approximately 1.0 on measure 10) in the last five years in the overall average quality of programs. The mean rating of an evaluator's familiarity with the work of program faculty (measure 11) is below 1.0 ("some familiarity") in every discipline--about which more will be said later in this chapter.

University Library (Measure 12). Measure 12, based on a composite index of the size[3] of the library at the university in which a program resides, is calculated on a scale from -2.0 to 3.0, with a mean of .2 in each of the four engineering disciplines. In considering this measure it must be remembered that the index reflects the overall size of the university library and that data are unavailable for some of the smaller universities.

Research Support (Measures 13-14). Measure 13, the proportion of program faculty who had received NSF, NIH, or ADAMHA[4] research grant awards during the FY1978-80 period, has mean values ranging from as high as .37 in chemical engineering to .20 in civil engineering. It should be emphasized that this measure does not take into account research support that faculty members have received from sources other than these three federal agencies. As mentioned in Chapter II, a significant fraction of the engineering faculty receive support from DOD, NASA, DOE, and other federal agencies. In terms of total university expenditures for R&D in engineering (measure 14), the mean value reported in each discipline is slightly less than $8,000,000. It should be emphasized that these figures represent university expenditures in engineering *in toto* and that data are not available on expenditures in individual engineering disciplines. Thus, the small differences reported here reflect variations in the sets of universities covered in the assessment in the four disciplines.

Publication Records (Measures 15 and 16). Some diversity is found in the mean number of articles associated with a research-doctorate program (measure 15). An average of 22 articles published in the 1978-79 period is reported for programs in electrical engineering; in each of the other three disciplines the mean number of articles ranges from .10 to .12. This difference reflects both the program size in a particular discipline (i.e., the total number of faculty and other staff members involved in research) and the frequency with which engineers in that discipline publish; it may also depend on the length of a typical paper in a discipline. Mean scores are not reported on measure 16, the estimated "overall influence" of the articles attributed to a program. Since this measure is calculated from an average of journal influence weights,[5] normalized for the journals covered in a particular discipline, mean differences among disciplines are uninterpretable.

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[3] The index, derived by the Association of Research Libraries, reflects a number of different measures, including number of volumes, fiscal expenditures, and other factors relevant to the size of a university library. See the description of this measure presented in Appendix D.

[4] Very few faculty members in engineering programs received any research support from the Alcohol, Drug Abuse, and Mental Health Administration.

CORRELATIONS AMONG MEASURES

Relations among the program measures are of intrinsic interest and are relevant to the issue of validity of the measures as indices of the quality of a research-doctorate program. Measures that are logically related to program quality are expected to be related to each other. To the extent that they are, a stronger case might be made for the validity of each as a quality measure.

A reasonable index of the relationship between any two measures is the Pearson product-moment correlation coefficient. A table of correlation coefficients of all possible pairs of measures is presented in each of the four preceding chapters. This chapter presents selected correlations to determine the extent to which coefficients are comparable in the four disciplines. Special attention is given to the correlations involving the number of FY1975-79 program graduates (measure 02), survey rating of the scholarly quality of program faculty (measure 08), university R&D expenditures in a particular discipline (measure 14), and influence-weighted number of publications (measure 16). These four measures have been selected because of their relatively high correlations with several other measures. Readers interested in correlations other than those presented in Tables 7.2, 7.3, 7.4, and 7.5 may refer to the third table in each of the preceding four chapters.

Correlations with Measure 02. Table 7.2 presents the correlations of measure 02 with each of the other measures used in the assessment. As might be expected, correlations of this measure with the other two measures of program size--number of faculty (01) and doctoral student enrollment (03)--are quite high in all four disciplines. Of greater interest are the strong positive correlations between measure 02 and measures derived from either reputational survey ratings or publication records. The coefficients describing the relationship of measure 02 with measures 15 and 16 are greater than .60 in all disciplines except mechanical engineering. This result is not surprising, of course, since both of the publication measures reflect total productivity and have not been adjusted for program size. The correlations of measure 02 with measures 08, 09, and 11 are equally as strong. It is quite

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[5] See Appendix F for a description of the derivation of this measure.

TABLE 7.2 Correlations of the Number of Program Graduates (Measure 02) with Other Measures, by Discipline

	Chemical Engin.	Civil Engin.	Electrical Engin.	Mechanical Engin.
Program Size				
01	.53	.83	.78	.66
03	.82	.71	.82	.78
Program Graduates				
04	.00	.01	-.09	-.11
05	.32	.16	.18	.17
06	.22	-.11	.10	-.01
07	.14	.05	.06	.12
Survey Results				
08	.83	.72	.76	.67
09	.83	.73	.75	.68
10	.07	.18	.11	.17
11	.79	.75	.81	.70
University Library				
12	.40	.39	.47	.32
Research Support				
13	.45	.39	.39	.33
14	.42	.51	.58	.58
Publication Records				
15	.66	.73	.84	.69
16	.69	.65	.85	.52

apparent that the programs that received high survey ratings and with which evaluators were more likely to be familiar were also ones that had larger numbers of graduates. Although the committee gave serious consideration to presenting an alternative set of survey measures that were adjusted for program size, a satisfactory algorithm for making such an adjustment was not found. In attempting such an adjustment on the basis of the regression of survey ratings on measures of program size, it was found that some exceptionally large programs appeared to be unfairly penalized and that some very small programs received unjustifiably high adjusted scores.

Measure 02 also has positive correlations with measure 12, an index of university library size, and with measures 13 and 14, which pertain to the level of support for research in a program. Of particular note are the moderately large coefficients for measure 14, university R&D expenditures in engineering--in all disciplines but chemical engineering they are above .50. The correlations of measure 02 with measures 04, 05, 06, and 07 are below .20 in all disciplines except chemical engineering.

Correlations with Measure 08. Table 7.3 shows the correlation coefficients for measure 08, the mean rating of the scholarly quality of program faculty, with each of the other variables. The correlations of measure 08 with measures of program size (01, 02, and 03) are .50 or greater for all four disciplines. Not surprisingly, the larger the program, the more likely its faculty is to be rated high in quality.

Correlations of measure 08 with measure 04, the fraction of students with national fellowship awards, are .20 or smaller in each of the engineering disciplines. For programs in the biological and social sciences, the corresponding coefficients (to be presented in subsequent volumes of the committee's report) are found to be greater, typically in the range .40 to .70. Perhaps in engineering, departments with highly regarded faculty are more likely to provide support to doctoral students as teaching assistants or research assistants on faculty research grants--thereby reducing dependency on national fellowships. (The low correlation of rated faculty quality with the fraction of students with national fellowships is not, of course, inconsistent with the thesis that programs with large numbers of students are programs with large numbers of fellowship holders.)

Correlations of rated faculty quality with measure 05, shortness of time from matriculation in graduate school to award of the doctorate, are notably higher for programs in chemical and mechanical engineering than for programs in the other two disciplines. Although the coefficients are by no means as large as many of those discussed above, it is evident that programs producing graduates in shorter periods of time tended to receive higher survey ratings.

Correlations of ratings of faculty quality with measure 06, the fraction of program graduates with definite employment plans, and with measure 07, the fraction with plans for employment in Ph.D.-granting institutions, are positive, but quite low for each of the engineering disciplines.

TABLE 7.3 Correlations of the Survey Ratings of Scholarly Quality of Program Faculty (Measure 08) with Other Measures, by Discipline

	Chemical Engin.	Civil Engin.	Electrical Engin.	Mechanical Engin.
Program Size				
01	.51	.73	.73	.65
02	.83	.72	.76	.67
03	.77	.57	.68	.64
Program Graduates				
04	.20	.18	-.03	.08
05	.43	.25	.21	.37
06	.27	.05	.13	.03
07	.25	.21	.12	.19
Survey Results				
09	.99	.98	.98	.97
10	.31	.35	.23	.14
11	.96	.94	.94	.95
University Library				
12	.41	.54	.56	.52
Research Support				
13	.62	.62	.56	.52
14	.42	.57	.59	.52
Publication Records				
15	.65	.62	.78	.70
16	.65	.57	.80	.57

The correlations of measure 08 with measure 09, rated effectiveness of doctoral education, are uniformly very high, at or above .97 in every discipline. This finding is consistent with results from the Cartter and Roose-Andersen studies.[6] The coefficients describing the relationship between measure 08 and measure 11, familiarity with the work of program faculty, are also very high, ranging from .94 to .96. In general, evaluators were more likely to have high regard for the quality of faculty in those programs with which they were most familiar. That the correlation coefficients are as large as observed may simply reflect the fact that "known" programs tend to be those that have earned strong reputations.

Correlations of ratings of faculty quality with measure 10, ratings of perceived improvement in program quality, range from .14 in mechanical engineering to .35 in civil engineering. One might have expected that a program judged to have improved in quality would have been somewhat more likely to receive high ratings on measure 08 than would a program judged to have declined--thereby imposing a small positive correlation between these two variables.

Moderate to high correlations are observed in all four disciplines between measure 08 and university library size (measure 12), support for research (measures 13 and 14), and publication records (measures 15 and 16). With few exceptions these coefficients are .50 or greater. Of particular note are the strong correlations with the two publication measures for electrical engineering programs. It is interesting to note that the correlations with measure 16 are generally no higher than those with measure 15--i.e., the "weighted influence" of journals in which articles are published yields an index that tends to relate no more closely to faculty reputation than does an unadjusted count of the number of articles published. This finding is inconsistent with the findings of Anderson et al.[7] and with the committee's findings in the mathematical and physical sciences.

Correlations with Measure 14. Correlations of measure 14, reported dollars of support for research and development, with other measures are shown in Table 7.4. The reader is reminded that this measure reflects total university expenditures in engineering and not expenditures in the four separate engineering disciplines. The pattern of relations is quite similar for programs in all four engineering disciplines: moderately high correlations with measures of program size and reputational survey results (except measure 10), and slightly lower correlations with publication measures. For programs in electrical engineering some of these relations are stronger than in the other engineering disciplines. Of particular note is strong correlation in electrical engineering between measure 14 and each of the publication measures (15 and 16). In interpreting these relationships one must keep in mind the fact that the research expenditure data have not been

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[6] Roose and Andersen, p. 19.
[7] Anderson et al., p. 95.

TABLE 7.4 Correlations of the University Research Expenditures in a Discipline (Measure 14) with Other Measures, by Discipline

	Chemical Engin.	Civil Engin.	Electrical Engin.	Mechanical Engin.
Program Size				
01	.48	.56	.63	.60
02	.42	.51	.58	.58
03	.50	.38	.62	.46
Program Graduates				
04	-.02	.16	.20	.04
05	.00	-.02	.12	.19
06	.07	-.02	.08	.03
07	.02	.21	.30	.13
Survey Results				
08	.42	.57	.59	.52
09	.41	.55	.57	.52
10	.18	.04	.09	.07
11	.41	.58	.62	.61
University Library				
12	.21	.26	.21	.20
Research Support				
13	.09	.29	.21	.16
Publication Records				
15	.39	.44	.61	.49
16	.35	.36	.65	.42

adjusted for the number of faculty and other staff members involved in research in a program.

Correlations with Measure 16. Measure 16 is the number of published articles attributed to a program and adjusted for the "average influence" of the journals in which the articles appear. The correlations of this measure with all others appear in Table 7.5. Of particular interest are the moderately high correlations with all three measures of program size and with the reputational survey results (excluding measure 10). Most of those coefficients exceed .60 and are generally somewhat larger for programs in electrical engineering. In this discipline moderately high correlations are also observed between measure 16 and measures 12, 13, and 14. It should be pointed out that the exceptionally large coefficients reported for measure 15 result from the fact that the two publication measures are logically as well as empirically interdependent.

Despite the appreciable correlations between reputational ratings of quality and program size measures, the functional relations between the two probably are complex. If there is a minimum size for a high-quality program, this size is likely to vary from discipline to discipline. Increases in size beyond the minimum may represent more high-quality faculty, or a greater proportion of inactive faculty, or a faculty with heavy teaching responsibilities. In attempting to select among these alternative interpretations, a single correlation coefficient provides insufficient guidance. Nonetheless, certain similarities across disciplines may be seen in correlations among the measures. High correlations consistently appear among measures 08, 09, and 11 from the reputational survey, and these measures also are prominently related to program size (measures 01, 02, and 03), to publication productivity (measures 15 and 16), to R&D expenditures (measure 14), and to library size (measure 12). These results show that for all disciplines the reputational rating measures (08, 09, and 11) tend to be associated with program size and with other correlates of size: publication volume, R&D expenditures, and library size. Also, the reputational measures 08, 09, and 11 tend to be positively related to shortness of time-to-Ph.D. (measure 05) and to the fraction of faculty holding research grants (measure 13).

ANALYSIS OF THE SURVEY RESPONSE

Measures 08-11, derived from the reputational survey, may be of particular interest to many readers since measures of this type have been the most widely used (and frequently criticized) indices of quality of graduate education. In designing the survey instrument for this assessment the committee made several changes in the form that had been used in the Roose-Andersen study. The modifications served two purposes: to provide the evaluators with a clearer understanding of the programs that they were asked to judge and to provide the committee with supplemental information for the analysis of the survey response. One change was to restrict to 50 the number of programs that any

TABLE 7.5 Correlations of the Influence-Weighted Number of Publications (Measure 16) with Other Measures, by Discipline

	Chemical Engin.	Civil Engin.	Electrical Engin.	Mechanical Engin.
Program Size				
01	.46	.69	.83	.59
02	.69	.65	.85	.52
03	.65	.52	.81	.45
Program Graduates				
04	.07	.17	.01	.02
05	.30	-.05	.10	.18
06	.23	.10	.19	.10
07	.14	.05	.14	.20
Survey Results				
08	.65	.57	.80	.57
09	.63	.57	.78	.61
10	.34	.35	.17	.24
11	.68	.58	.84	.60
University Library				
12	.12	.32	.51	.36
Research Support				
13	.35	.26	.52	.19
14	.35	.36	.65	.42
Publication Records				
15	.96	.95	.98	.88

individual was asked to evaluate. Probably the most important change was the inclusion of lists of names and ranks of individual faculty members involved in the research-doctorate programs to be evaluated on the survey form, together with the number of doctoral degrees awarded in the previous five years. Ninety percent of the evaluators were sent forms with faculty names and numbers of degrees awarded; the remaining 10 percent were given forms without this information, so that an analysis could be made of the effect of this modification on survey results. Another change was the addition of a question concerning an evaluator's familiarity with each of the programs. In addition to providing an index of program recognition (measure 11), the inclusion of this question permits a comparison between the ratings furnished by individuals who had considerable familiarity with a particular program and the ratings by those not as familiar with the program. Each evaluator was also asked to identify his or her own institution of highest degree and current field of specialization. This information enables us to compare, for each program, the ratings furnished by alumni of that institution with the ratings by other evaluators, as well as to examine differences in the ratings supplied by evaluators in certain specialty fields.

Before examining factors that may have influenced the survey results, some mention should be made of the distributions of responses to the four survey items and the reliability (consistency) of the ratings. As can be seen from Table 7.6, the response distribution for each survey item does not vary greatly from discipline to discipline. For example, in judging the scholarly quality of faculty (measure 08), survey respondents in each discipline rated between 5 and 8 percent of the programs as being "distinguished" and between 1 and 2 percent as "not sufficient for doctoral education." In evaluating the effectiveness in educating research scholars, they rated 6-9 percent of the programs as being "extremely effective" and approximately 2-4 percent as "not effective." Of particular interest in this table are the frequencies with which evaluators failed to provide responses to measures 08, 09, and 10. Approximately one-third of the total number of evaluations requested for measure 08 were not furnished because survey respondents in engineering felt that they were not familiar enough with a particular program to evaluate it. The corresponding percentages of "don't know" responses for measures 09 and 10 are considerably larger--42 and 52 percent, respectively--suggesting that survey respondents found it more difficult (or were less willing) to judge program effectiveness and change than to judge the scholarly quality of program faculty.

The large fractions of "don't know" responses are a matter of some concern. However, given the broad coverage of research-doctorate programs, it is not surprising that faculty members would be unfamiliar with many of the less distinguished programs. As shown in Table 7.7, survey respondents in each discipline were much more likely to furnish evaluations for programs with high reputational standing than they were for programs of lesser distinction. For example, for engineering programs that received mean ratings of 4.0 or higher on measure 08, almost 95 percent of the evaluations requested on measure 08 were pro-

TABLE 7.6 Distribution of Responses to Each Survey Item, by Discipline

	Survey Measure	Total	Chemical Engin.	Civil Engin.	Electrical Engin.	Mechanical Engin.
08	SCHOLARLY QUALITY OF PROGRAM FACULTY					
	Distinguished	6.5	7.8	6.5	5.4	5.9
	Strong	14.0	14.5	13.8	13.4	14.3
	Good	20.5	24.0	19.2	19.2	19.1
	Adequate	16.7	20.5	14.5	15.3	15.6
	Marginal	7.3	8.6	6.8	7.6	5.8
	Not Sufficient for Doctoral Education	1.8	1.9	2.2	1.8	1.4
	Don't Know Well Enough to Evaluate	33.3	22.6	37.1	37.4	38.0
	TOTAL	100.0	100.0	100.0	100.0	100.0
09	EFFECTIVENESS OF PROGRAM IN EDUCATING SCIENTISTS					
	Extremely Effective	7.1	8.6	7.0	5.9	6.6
	Reasonably Effective	31.6	34.3	28.8	30.0	32.6
	Minimally Effective	16.9	20.4	16.6	15.9	14.1
	Not Effective	2.8	3.8	3.3	2.4	1.7
	Don't Know Well Enough to Evaluate	41.6	32.8	44.3	45.8	45.0
	TOTAL	100.0	100.0	100.0	100.0	100.0
10	CHANGE IN PROGRAM QUALITY IN LAST FIVE YEARS					
	Better	10.6	15.2	8.8	9.3	8.0
	Little or No Change	30.3	36.5	26.5	28.1	28.7
	Poorer	7.4	9.0	7.2	6.7	6.4
	Don't Know Well Enough to Evaluate	51.8	39.2	57.5	55.8	57.0
	TOTAL	100.0	100.0	100.0	100.0	100.0
11	FAMILIARITY WITH WORK OF PROGRAM FACULTY					
	Considerable	16.8	22.8	16.3	14.4	12.9
	Some	42.0	44.7	40.6	40.4	41.7
	Little or None	39.6	31.1	41.5	43.1	44.3
	No Response	1.6	1.5	1.6	2.1	1.1
	TOTAL	100.0	100.0	100.0	100.0	100.0

NOTE: For survey measures 08, 09, 10 the "don't know" category includes a small number of cases for which the respondents provided no response to the survey item.

TABLE 7.7 Survey Item Response Rates, by Discipline and Mean Rating on Measure 08

Survey Measure	Total	Chemical Engin.	Civil Engin.	Electrical Engin.	Mechanical Engin.
08 SCHOLARLY QUALITY OF PROGRAM FACULTY					
Mean Rating on Measure 08					
4.0 or Higher	94.5	98.5	91.7	96.3	89.3
3.0 - 3.9	80.9	92.1	78.0	77.7	76.6
2.0 - 2.9	62.9	76.2	59.3	57.9	57.4
Less than 2.0	49.0	59.3	43.8	45.0	42.1
09 EFFECTIVENESS OF PROGRAM IN EDUCATING SCIENTISTS					
Mean Rating on Measure 08					
4.0 or Higher	90.4	94.3	88.4	91.4	85.1
3.0 - 3.9	72.8	83.5	71.7	67.9	69.2
2.0 - 2.9	53.5	64.0	50.3	49.3	49.7
Less than 2.0	41.1	48.7	37.9	37.6	36.4
10 CHANGE IN PROGRAM QUALITY IN LAST FIVE YEARS					
Mean Rating on Measure 08					
4.0 or Higher	80.2	90.8	75.7	76.2	70.2
3.0 - 3.9	61.0	77.8	55.4	55.7	55.7
2.0 - 2.9	43.9	58.2	37.3	40.7	38.6
Less than 2.0	31.4	39.4	27.3	29.0	24.9

vided; 90 and 80 percent, respectively, were provided on measures 09 and 10. In contrast, the corresponding response rates for programs with mean ratings below 2.0 are much lower--49, 41, and 31 percent response on measures 08, 09, and 10, respectively.

Of great importance to the interpretation of the survey results is the reliability of the response. How much confidence can one have in the mean rating reported for a particular program? In the first table in each of the preceding four chapters, estimated standard errors associated with the mean ratings of every program are presented for all four survey items (measures 08-11). While there is some variation in the magnitude of the standard errors reported in every discipline, they rarely exceed .20 for any of the four measures and typically range from .05 to .10. For programs with higher mean ratings the estimated errors associated with these means are generally smaller--a finding consistent with the fact that survey respondents were more likely to furnish evaluations for programs with high reputational standing. The "split-half" correlations[8] presented in Table 7.8 give an indication of the overall reliability of the survey results in each discipline and for each measure. In the derivation of these correlations individual ratings of each program were randomly divided into two groups (A and B), and a separate mean rating was computed for each group. The last column in Table 7.8 reports the correlations between the mean program ratings of the two groups and is not corrected for the fact that the mean ratings of each group are based on only half rather than a full set of the responses.[9] As the reader will note, the coefficients reported for measure 08, the scholarly quality of program faculty, are in the range of .95 to .98--indicating a high degree of consistency in evaluators' judgments. The correlations reported for measures 09 and 11, the rated effectiveness of a program and the evaluators' familiarity with a program, are somewhat lower but still at a level of .90 or higher in each discipline. Not surprisingly, the reliability coefficients for ratings of change in program quality in the last five years (measure 10) are considerably lower, ranging from .66 to .88 in the four engineering disciplines. While these coefficients represent tolerable reliability, it is quite evident that the responses to measure 10 are not as reliable as the responses to the other three items.

Further evidence of the reliability of the survey responses is presented in Table 7.9. As mentioned in Chapter VI of the first volume (mathematical and physical sciences) of the committee's reports, 11

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[8] For a discussion of the interpretation of "split-half" coefficients, see Robert L. Thorndike and Elizabeth Hagan, Measurement and Evaluation in Psychology and Education, John Wiley & Sons, New York, 1969, pp. 182-185.

[9] To compensate for the smaller sample size the "split-half" coefficient may be adjusted using the Spearman-Brown formula: $r' = 2r/(1 + r)$. This adjustment would have the effect of increasing a correlation of .70, for example, to .82, a correlation of .80 to .89, a correlation of .90 to .95, and a correlation of .95 to .97.

TABLE 7.8 Correlations Between Two Sets of Average Ratings from Two Randomly Selected Groups of Evaluators in Engineering

MEASURE 08: SCHOLARLY QUALITY OF PROGRAM FACULTY

Discipline	Mean Rating		Std. Deviation		Correlation	
	Group A	Group B	Group A	Group B	N	r
Chemical Engin.	2.65	2.68	.95	.96	79	.98
Civil Engin.	2.67	2.67	.85	.88	74	.95
Electrical Engin.	2.62	2.59	.86	.89	90	.95
Mechanical Engin.	2.75	2.73	.79	.80	81	.96

MEASURE 09: EFFECTIVENESS OF PROGRAM IN EDUCATING SCHOLARS

Discipline	Mean Rating		Std. Deviation		Correlation	
	Group A	Group B	Group A	Group B	N	r
Chemical Engin.	1.59	1.60	.54	.53	79	.97
Civil Engin.	1.58	1.56	.48	.49	74	.90
Electrical Engin.	1.60	1.60	.46	.47	90	.92
Mechanical Engin.	1.70	1.71	.41	.40	81	.94

MEASURE 10: IMPROVEMENT IN PROGRAM IN LAST FIVE YEARS

Discipline	Mean Rating		Std. Deviation		Correlation	
	Group A	Group B	Group A	Group B	N	r
Chemical Engin.	1.07	1.09	.27	.27	79	.88
Civil Engin.	1.00	1.01	.25	.24	74	.69
Electrical Engin.	1.06	1.04	.25	.24	90	.66
Mechanical Engin.	1.03	1.03	.22	.22	81	.74

MEASURE 11: FAMILIARITY WITH WORK OF PROGRAM FACULTY

Discipline	Mean Rating		Std. Deviation		Correlation	
	Group A	Group B	Group A	Group B	N	r
Chemical Engin.	.92	.92	.40	.41	79	.97
Civil Engin.	.73	.75	.35	.35	74	.94
Electrical Engin.	.70	.72	.36	.35	90	.93
Mechanical Engin.	.68	.69	.30	.31	81	.90

TABLE 7.9 Comparison of Mean Ratings for 11 Mathematics Programs Included in Two Separate Survey Administrations

	Survey Measure	All Evaluators				Evaluators Rating the Same Program in Both Surveys			
		First		Second		First		Second	
		N	$\overline{X}$	N	$\overline{X}$	N	$\overline{X}$	N	$\overline{X}$
Program A	08	100	4.9	114	4.9	50	4.9	50	4.9
	09	90	2.7	100	2.8	42	2.7	43	2.7
	10	74	1.2	83	1.2	38	1.1	34	1.2
	11	100	1.6	115	1.6	50	1.5	50	1.6
Program B	08	94	4.6	115	4.6	48	4.6	50	4.5
	09	81	2.6	91	2.5	40	2.6	39	2.5
	10	69	1.0	82	1.0	37	1.0	36	0.9
	11	98	1.4	116	1.4	50	1.5	50	1.5
Program C	08	86	3.4	103	3.6	42	3.4	44	3.5
	09	56	2.0	66	2.1	28	2.1	29	2.0
	10	55	1.1	62	1.3	30	1.2	27	1.4
	11	99	1.0	116	1.1	50	1.1	50	1.0
Program D	08	74	3.0	93	3.0	37	2.8	38	2.9
	09	50	1.8	48	1.6	27	1.7	16	1.6
	10	46	1.4	52	1.5	24	1.4	23	1.5
	11	90	1.0	113	0.9	46	1.0	46	0.9
Program E	08	69	3.0	95	3.1	39	3.0	46	3.1
	09	40	1.8	60	1.9	25	1.8	30	1.8
	10	36	0.8	58	0.9	24	0.8	29	0.9
	11	96	0.8	115	0.9	52	0.9	52	1.0
Program F	08	63	2.9	90	3.0	26	3.0	32	3.1
	09	35	1.8	46	1.7	10	1.6	13	1.8
	10	32	1.1	43	1.1	11	1.3	12	1.2
	11	95	0.7	115	0.8	43	0.7	44	0.7
Program G	08	69	2.7	92	2.8	39	2.7	39	3.0
	09	35	1.7	45	1.6	17	1.7	19	1.7
	10	36	1.1	43	1.2	17	1.1	19	1.2
	11	85	0.9	116	0.8	46	0.9	46	0.9
Program H	08	58	2.2	73	2.5	36	2.2	37	2.4
	09	32	1.3	43	1.3	22	1.2	19	1.3
	10	30	1.5	39	1.5	20	1.7	17	1.4
	11	90	0.7	116	0.6	51	0.7	52	0.6
Program I	08	55	2.0	74	1.9	30	1.9	30	2.0
	09	33	1.0	41	0.9	19	1.0	18	0.8
	10	27	1.2	31	1.1	15	1.1	13	1.2
	11	99	0.5	115	0.5	50	0.5	50	0.5
Program J	08	51	1.5	67	1.5	26	1.4	28	1.4
	09	31	0.8	36	0.7	14	0.6	14	0.7
	10	26	1.2	23	1.1	14	1.2	12	1.3
	11	96	0.5	113	0.3	49	0.4	48	0.4
Program K	08	33	1.2	48	1.2	17	1.1	21	1.4
	09	19	0.8	21	0.5	11	0.6	8	0.4
	10	12	0.8	15	0.9	5	1.0	5	0.8
	11	99	0.2	114	0.2	48	0.2	47	0.2

mathematics programs,[10] selected at random, were included on a second form sent to 178 survey respondents in this discipline, and 116 individuals (65 percent) furnished responses to the second survey. A comparison of the overall results of the two survey administrations (columns 2 and 4 in Table 7.9) demonstrates the consistency of the ratings provided for each of the 11 programs. The average, absolute observed difference in the two sets of mean ratings is less than 0.1 for each measure. Columns 6 and 8 of Table 7.9 report the results based on the responses of only those evaluators who had been asked to consider a particular program in both administrations of the survey. (For a given program approximately 40-45 percent of the 116 respondents to the second survey had been asked to evaluate that program in the prior survey.) It is not surprising to find comparable small differences in the mean ratings provided by this subgroup of evaluators.

Critics of past reputational studies have expressed concern about the credibility of reputational assessments when evaluators provide judgments of programs about which they may know very little. As already mentioned, survey participants in this study were offered the explicit alternative, "Don't know well enough to evaluate." This response option was quite liberally used for measures 08, 09, and 10, as is shown in Table 7.6. In addition, evaluators were asked to indicate their degree of familiarity with each program. Respondents reported "considerable" familiarity with an average of only one program in every six. While this finding supports the conjecture that many program ratings are based on limited information, the availability of reported familiarity permits us to analyze how ratings vary as a function of familiarity.

This issue can be addressed in more than one way. It is evident from the data reported in Table 7.10 that mean ratings of the scholarly quality of program faculty tend to be higher if the evaluator has considerable familiarity with the program. There is nothing surprising or, for that matter, disconcerting about such an association. When a particular program fails to provoke more than vague images in the evaluator's mind, he or she is likely to take this as some indication that the program is not an extremely lustrous one on the national scene. While visibility and quality are scarcely the same, the world of research in higher education is structured to encourage high quality to achieve high visibility, so that any association of the two is far from spurious.

From the data presented in Table 7.10 it is evident that if mean ratings were computed on the basis of the responses of only those most familiar with programs, the values reported for individual programs would be increased. A largely independent question is whether a restriction of this kind would substantially change our sense of the relative standings of programs on this measure. Quite naturally, the answer depends in some degree on the nature of the restriction imposed.

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[10] Mathematics is the only discipline in which results were obtained from two separate administrations of the survey.

TABLE 7.10 Mean Ratings of Scholarly Quality of Program Faculty, by Evaluator's Familiarity with Work of Faculty

	MEAN RATINGS		CORRELATION	
	Considerable	Some/ Little	r	N
Chemical Engin.	2.91	2.58	.93	79
Civil Engin.	2.93	2.56	.87	74
Electrical Engin.	3.01	2.52	.84	89
Mechanical Engin.	3.23	2.65	.84	80

NOTE: N reported in last column represents the number of programs with a rating from at least one evaluator in each of the two groups.

For example, if we exclude evaluations provided by those who confessed "little or no" familiarity with particular programs, then the revised mean ratings would be correlated at a level of at least .99 with the mean ratings computed using all of the data. (This similarity arises, in part, because only a small fraction of evaluations are given on the basis of no more than "little" familiarity with the program.)

The third column in Table 7.10 presents the correlation in each discipline between the array of mean ratings supplied by respondents claiming "considerable" familiarity and the mean ratings of those indicating "some" or "little or no" familiarity with particular programs. This coefficient is a rather conservative estimate of agreement since there is not a sufficient number of ratings from those with "considerable" familiarity to provide highly stable means. Were more such ratings available, one might expect the correlations to be higher. However, even in the form presented, the correlations, which are at least .84 in all four disciplines, are high enough to suggest that the relative standing of programs on measure 08 is not greatly affected by the admixtures of ratings from evaluators who recognize that their knowledge of a given program is limited.

As mentioned previously, 90 percent of the survey sample members were supplied the names of faculty members associated with each program to be evaluated, along with the reported number of program graduates (Ph.D. or equivalent degrees) in the previous five years. Since earlier reputational surveys had not provided such information, 10 percent of the sample members, randomly selected, were given forms without faculty names or doctoral data, as a "control group." Although one might expect that those given faculty names would have been more likely than other survey respondents to provide evaluations of the scholarly quality of program faculty, consistently large differences were not found (see Table 7.11) between the two groups in their frequency of response to this survey item. (The reader may recall that the

TABLE 7.11 Item Response Rate on Measure 08, by Selected Characteristics of Survey Evaluators in Engineering

	Total	Chemical Engin.	Civil Engin.	Electrical Engin.	Mechanical Engin.
EVALUATOR'S FAMILIARITY WITH PROGRAM					
Considerable	99.9	99.9	100.0	99.8	99.9
Some	98.2	99.1	96.9	98.5	97.8
Little or None	21.1	31.7	17.1	18.6	18.4
TYPE OF SURVEY FORM					
Names	66.4	76.4	63.3	61.7	62.0
No Names	70.2	88.6	59.3	71.8	62.0
INSTITUTION OF HIGHEST DEGREE					
Alumni	98.5	100.0	97.2	98.2	98.4
Nonalumni	66.4	77.1	62.6	62.3	61.7
EVALUATOR'S PROXIMITY TO PROGRAM					
Same Region	79.0	85.1	78.3	75.8	75.7
Outside Region	65.0	76.2	61.0	60.7	60.1

NOTE: The item response rate is the percentage of the total ratings requested from survey participants that included a response other than "don't know."

provision of faculty names apparently had a positive effect on survey sample members' willingness to complete and return their questionnaires in engineering disciplines.[11])

The mean ratings provided by the group furnished faculty names are lower than the mean ratings supplied by other respondents in all disciplines but chemical engineering (see Table 7.12). Although small, the differences found in civil, electrical, and mechanical engineering are not what might have been expected. After all, those programs more familiar to evaluators tended to receive higher ratings, yet when steps were taken to enhance the evaluator's familiarity, the resulting ratings are somewhat lower. One post hoc interpretation of this finding is that a program may be considered to have distinguished faculty if even only a few of its members are considered by the evaluator to be outstanding in their field. However, when a full list of program faculty is provided, the evaluator may be influenced by the number of individuals whom he or she could not consider to be distinguished. Thus, the presentation of these additional, unfamiliar names may occasionally result in a lower rating of program faculty.

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[11] As shown in Table 2.3, the survey response rate for those furnished faculty names is approximately 5 percentage points higher than that for those not given this information.

However interesting these effects may be, one should not lose sight of the fact that they are small at best and that their existence does not necessarily imply that a program's relative standing on measure 08 would differ much whichever type of survey form was used. Since only about 1 in 10 ratings was supplied without the benefit of faculty names, it is hard to establish any very stable picture of relative mean ratings of individual programs. However, the correlations between the mean ratings supplied by the two groups are reasonably high--ranging from .77 to .96 in the four disciplines (see Table 7.12). Were these coefficients adjusted for the fact that the group furnished forms without names constituted only about 10 percent of the survey respondents, they would be substantially larger. From this result it seems reasonable to conclude that differences in the alternative survey forms used are not likely to be responsible for any large-scale reshuffling in the reputational ranking of programs on measure 08. It also suggests that the inclusion of faculty names in the committee's assessment need not prevent comparisons of the results with those obtained from the Roose-Andersen survey.

Another factor that might be thought to influence an evaluator's judgment about a particular program is the geographic proximity of that program to the evaluator. There is enough regional traffic in academic life that one might expect proximate programs to be better known than those in distant regions of the country. This hypothesis may apply especially to the smaller and less visible programs and is confirmed by the survey results. For purposes of analysis, programs

TABLE 7.12 Mean Ratings of Scholarly Quality of Program Faculty, by Type of Survey Form Provided to Evaluator

	MEAN RATINGS		CORRELATION	
	Names	No Names	r	N
Chemical Engin.	2.68	2.47	.96	79
Civil Engin.	2.66	2.91	.77	73
Electrical Engin.	2.60	2.61	.86	90
Mechanical Engin.	2.73	2.81	.87	81

NOTE: N reported in last column represents the number of programs with a rating from at least one evaluator in each of the two groups.

TABLE 7.13 Mean Ratings of Scholarly Quality of Program Faculty, by Evaluator's Proximity to Region of Program

	MEAN RATINGS		CORRELATION	
	Nearby	Outside	r	N
Chemical Engin.	2.75	2.66	.94	79
Civil Engin.	2.70	2.68	.86	73
Electrical Engin.	2.71	2.61	.86	87
Mechanical Engin.	2.72	2.74	.87	81

NOTE: N reported in last column represents the number of programs with a rating from at least one evaluator in each of the two groups.

were assigned to one of nine geographic regions[12] in the United States, and ratings of programs within an evaluator's own region are categorized in Table 7.13 as "nearby." Ratings of programs in any of the other eight regions were put in the "outside" group. Findings reported elsewhere in this chapter confirm that evaluators were more likely to provide ratings if a program was within their own region of the country,[13] and it is reasonable to imagine that the smaller and the less visible programs received a disproportionate share of their ratings either from evaluators within their own region or from others who for one reason or another were particularly familiar with programs in that region.

Although the data in Table 7.13 suggest that "nearby" programs were given higher ratings than those outside the evaluator's region, the differences in reported means are quite small and probably represent no more than a secondary effect that might be expected, because, as we have already seen, evaluators tended to rate higher those programs with which they were more familiar. Furthermore, the high correlations found between the mean ratings of the two groups indicate that the relative standings of programs are not dramatically influenced by the geographic proximity of those evaluating them.

Another consideration that troubles some critics is that large programs may be unfairly favored in a faculty survey because they are likely to have more alumni contributing to their ratings who, it would stand to reason, would be generous in the evaluations of their alma maters. Information collected in the survey on each evaluator's institution of highest degree enables us to investigate this concern. The findings presented in Table 7.14 support the hypothesis that alumni provided generous ratings--with differences in the mean ratings (for

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[12] See Appendix I for a list of the states included in each region.
[13] See Table 7.11.

TABLE 7.14 Mean Ratings of Scholarly Quality of Program Faculty, by Evaluator's Institution of Highest Degree

	MEAN RATINGS		NUMBER OF PROGRAMS WITH ALUMNI RATINGS
	Alumni	Nonalumni	N
Chemical Engin.	3.77	3.35	32
Civil Engin.	3.96	3.23	27
Electrical Engin.	3.76	3.33	29
Mechanical Engin.	3.99	3.38	27

NOTE: The pairs of means reported in each discipline are computed for a subset of programs with a rating from at least one alumnus and are substantially greater than the mean ratings for the full set of programs in each discipline.

measure 08) of alumni and nonalumni ranging from .42 to .73 in the four disciplines. Given the appreciable differences between the ratings furnished by program alumni and other evaluators, one might ask how much effect this has had on the overall results of the survey. The answer is "very little." As shown in the table, only about one program in every three received ratings from any alumnus.[14] Moreover, the fraction of alumni providing ratings of a program is always quite small and should have had minimal impact on the overall mean rating of any program. To be certain that this was the case, mean ratings of the scholarly quality of faculty were recalculated for every engineering program--with the evaluations provided by alumni excluded. The results were compared with the mean scores based on a full set of evaluations. Out of the 324 engineering programs evaluated in the survey, only 1 program (in civil engineering) had an observed difference as large as 0.2, and for 306 programs (94 percent) their mean ratings remain unchanged (to the nearest tenth of a unit). On the basis of these findings the committee saw no reason to exclude alumni ratings in the calculation of program means.

Another concern that some critics have is that a survey evaluation may be affected by the interaction of the research interests of the evaluator and the area(s) of focus of the research-doctorate program to be rated. It is said, for example, that some narrowly focused programs may be strong in a particular area of research but that this strength may not be recognized by a large fraction of evaluators who happen to be unknowledgeable in this area. This is a concern more difficult to address than those discussed in the preceding pages since little or no information is available about the areas of focus of the programs being evaluated (although in certain disciplines the title of a department or academic unit may provide a clue). To obtain a better understanding of the extent to which an evaluator's field of specialty may have influenced the ratings he or she has provided, an analysis was made of ratings provided by evaluators in physics and statistics/biostatistics. In each discipline the survey participants were divided into two groups according to specialty field (as reported on the survey questionnaire). The results of the analysis, which are presented in the mathematical and physical sciences volume of the committee's report, indicate that there is a high degree of correlation in the mean ratings provided by those in differing specialty fields within these two disciplines. Although one cannot conclude from these findings that an evaluator's specialty field has no bearing on how he or she rates a program, these findings do suggest that the relative standings of programs in physics and statistics/biostatistics would not be greatly altered if the ratings by either group were discarded.

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[14] Because of the small number of alumni ratings in every discipline, the mean ratings for this group are unstable and therefore the correlations between alumni and nonalumni mean ratings are not reported.

INTERPRETATION OF REPUTATIONAL SURVEY RATINGS

It is not hard to foresee that results from this survey will receive considerable attention through enthusiastic and uncritical reporting in some quarters and sharp castigation in others. The study committee understands the grounds for both sides of this polarized response but finds that both tend to be excessive. It is important to make clear how we view these ratings as fitting into the larger study of which they are a part.

The reputational results are likely to receive a disproportionate degree of attention for several reasons, including the fact that they reflect the opinions of a large group of faculty colleagues and that they form a bridge with earlier studies of graduate programs. But the results will also receive emphasis because they alone, among all of the measures, seem to address quality in an overall or global fashion. While most recognize that "objective" program characteristics (i.e., publication productivity, research funding, or library size) have some bearing on program quality, probably no one would contend that a single one of these measures encompasses all that need be known about the quality of research-doctorate programs. Each is obviously no more than an indicator of some aspect of program quality. In contrast, the reputational ratings are global from the start because the respondents are asked to take into account many objective characteristics and to arrive at a general assessment of the quality of the faculty and effectiveness of the program. This generality has self-evident appeal.

On the other hand, it is wise to keep in mind that these reputational ratings are measures of perceived program quality rather than of "quality" in some ideal or absolute sense. What this means is that, just as for all of the more objective measures, the reputational ratings represent only a partial view of what most of us would consider quality to be; hence, they must be kept in careful perspective.

Some critics may argue that such ratings are positively misleading because of a variety of methodological artifacts or because they are supplied by "judges" who often know very little about the programs they are rating. The committee has conducted the survey in a way that permits the empirical examination of a number of the alleged artifacts and, although our analysis is by no means exhaustive, the general conclusion is that their effects are slight.

At the same time, criticisms of reputational ratings from prior studies represent a perspective that may be misguided. This perspective assumes that one asks for ratings in order to find out what "quality" really is and that to the degree that the ratings miss the mark of "quintessential quality," they are unreal, although the quality that they attempt to measure is real. What this perspective misses is the reality of quality and the fact that impressions of quality, if widely shared, have an imposing reality of their own and therefore are worth knowing about in their own right. After all, these perceptions govern a large-scale system of traffic around the nation's graduate institutions--for example, when undergraduate students seek the advice of their professor concerning graduate programs that they might attend. It is possible that some professors put in this position disqualify themselves on grounds that they are not well informed about the relative merits of the programs being considered. Most faculty members, however, surely attempt to be helpful on the basis of impressions gleaned from their professional experience, and these assessments are likely to have major impact on student decision-making. In short, the impressions are real and have very real effects not only on students shopping for graduate schools but also on other flows, such as job-seeking young faculty and the distribution of research resources. At the very least, the survey results provide a snapshot of these impressions from discipline to discipline. Although these impressions may be far from ideally informed, they certainly show a strong degree of consensus within each discipline, and it seems safe to assume that they are more than passingly related to what a majority of keen observers might agree program quality is all about.

COMPARISON WITH RESULTS OF THE ROOSE-ANDERSEN STUDY

An analysis of the response to the committee's survey would not be complete without comparing the results with those obtained in the survey by Roose and Andersen 12 years earlier. Although there are obvious similarities in the two surveys, there are also some important differences that should be kept in mind in examining individual program ratings of the scholarly quality of faculty. Already mentioned in this chapter is the inclusion, on the form sent to 90 percent of the sample members in the committee's survey, of the names and academic ranks of faculty and the numbers of doctoral graduates in the previous five years. Other significant changes in the committee's form are the identification of the university department or academic unit in which each program may be found, the restriction of requesting evaluators to make judgments about no more than 50 research-doctorate programs in their discipline, and the presentation of these programs in random sequence on the survey form. The sampling frames used in the two surveys also differ. The sample selected in the earlier study included only individuals who had been nominated by the participating universities, while more than one-fourth of the sample in the committee's survey were chosen at random from full faculty lists. (Except for this difference the samples were quite similar--i.e., in terms of number of evaluators in each discipline and the fraction of senior scholars.[15])

Several dissimilarities in the coverage of the Roose-Andersen and this committee's reputational assessments should be mentioned. The former included a total of 130 institutions that had awarded at least 100 doctoral degrees in two or more disciplines during the FY1958-67 period. The institutional coverage in the committee's assessment was based on the number of doctorates awarded in each discipline (as described in Chapter I) and covered a total population of 228 universities. Most of the universities represented in the later study but not the earlier one are institutions that offered research-doctorate programs in a limited set of disciplines. Finally, in the Roose-Andersen study, ratings were compiled on only one program from each institution represented in a discipline, whereas in the committee's survey separate ratings were requested if a university offered more than one research-doctorate program in a given discipline. The consequences of these differences in survey coverage are quite apparent: in the committee's survey, evaluations were requested for a total of 326 research-doctorate programs in chemical, civil, electrical, and mechanical engineering compared with 287 programs in the Roose-Andersen study.

Figures 7.1-7.4 plot the mean ratings of scholarly quality of faculty in programs included in both surveys; sets of ratings are graphed for 61 programs in chemical engineering, 57 in civil engineering, 66 in electrical engineering, and 61 in mechanical engineering. Since in the Roose-Andersen study programs were identified by institution and discipline (but not by department) the matching of results from this survey with those from the committee's survey is not precise. For universities represented in the latter survey by more than one program in a particular discipline, the mean rating for the program with the largest number of graduates (measure 02) is the only one plotted here. Although the results of both surveys are reported on identical scales, some caution must be taken in interpreting differences in the mean ratings a program received in the two evaluations. It is impossible to estimate what effect all of the differences described above may have had on the results of the two surveys. Furthermore, one must

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[15] For a description of the sample group used in the earlier study, see Roose and Andersen, pp. 28-31.

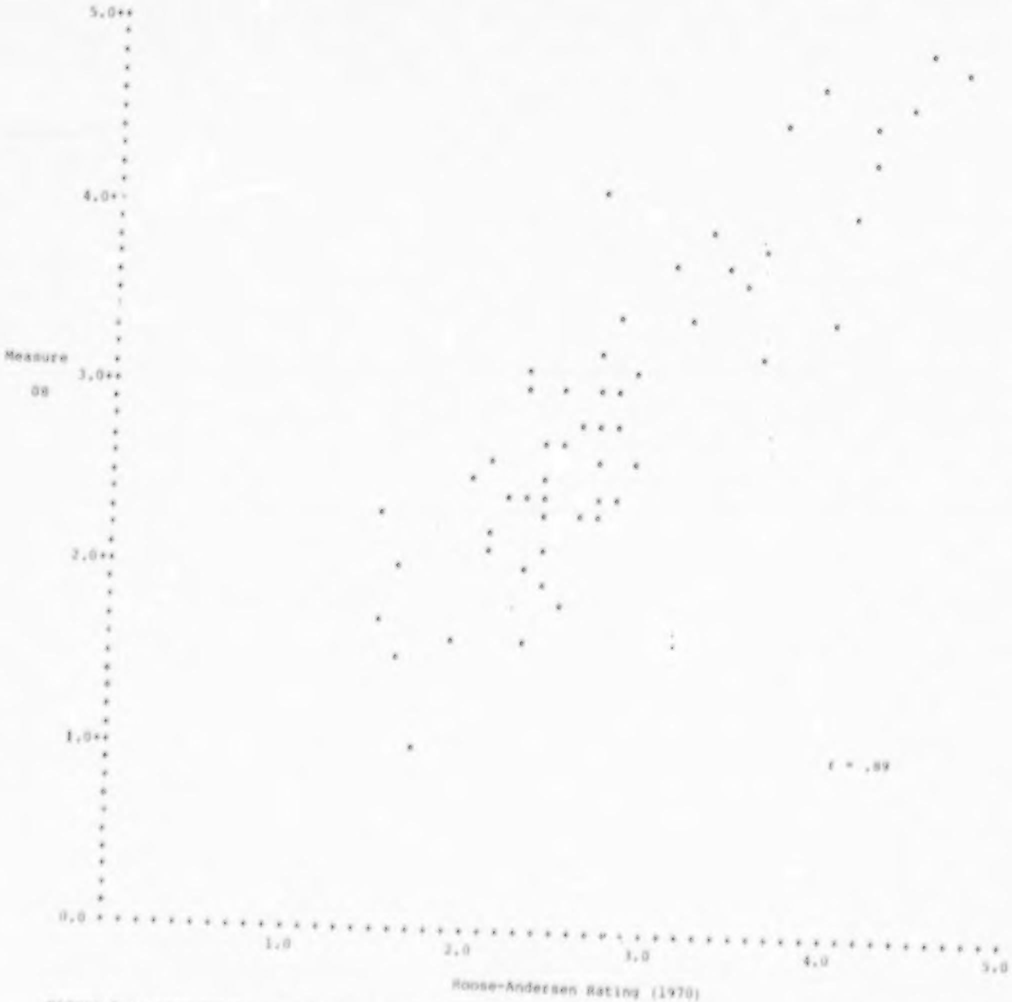

FIGURE 7.1 Mean rating of scholarly quality of faculty (measure 08) versus mean rating of faculty in the Roose-Andersen study--61 programs in chemical engineering.

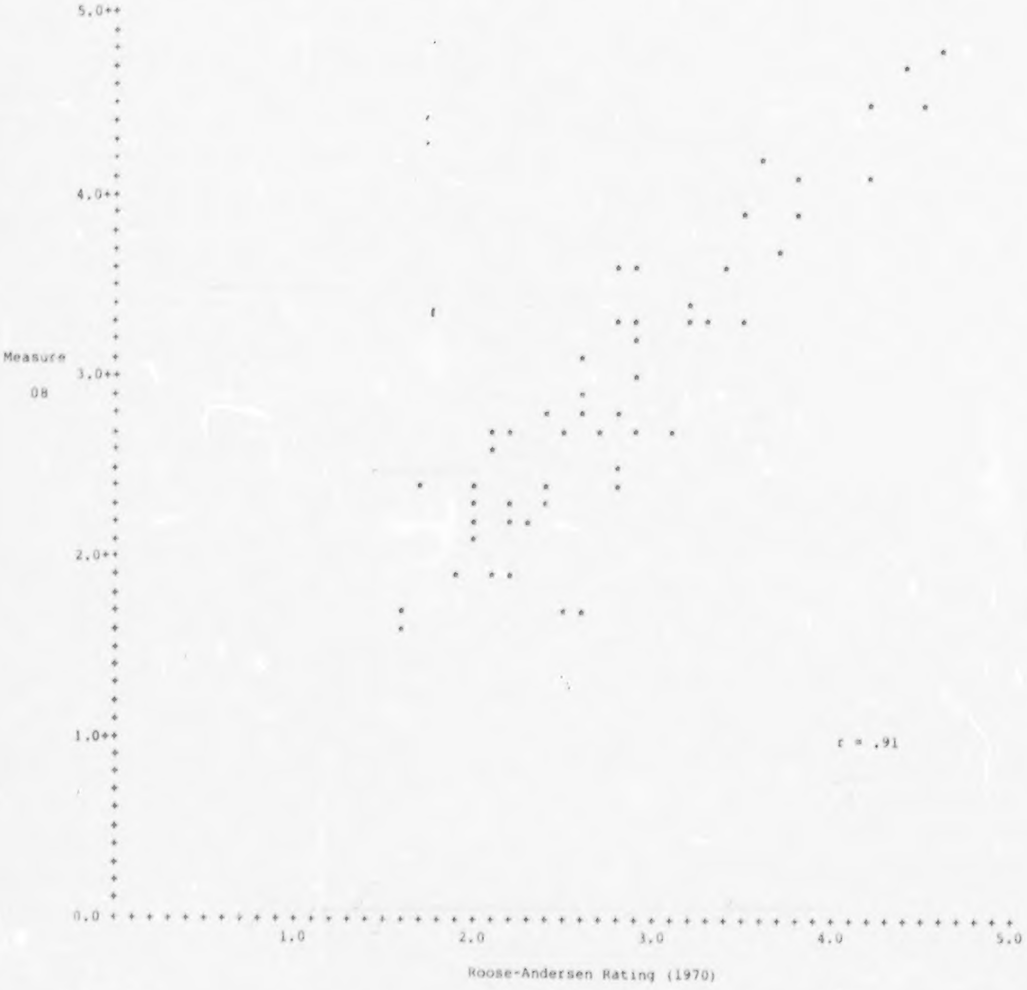

FIGURE 7.2 Mean rating of scholarly quality of faculty (measure 08) versus mean rating of faculty in the Roose-Andersen study--57 programs in civil engineering.

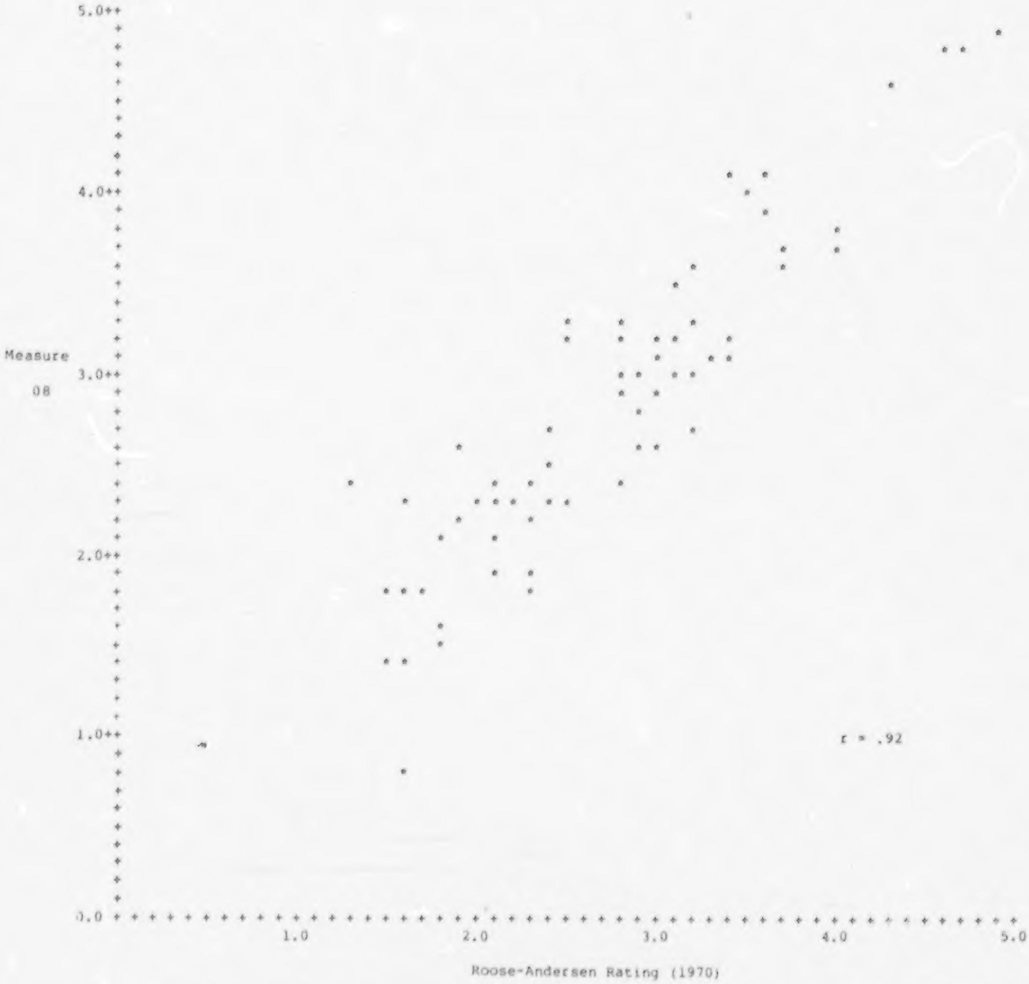

FIGURE 7.3 Mean rating of scholarly quality of faculty (measure 08) versus mean rating of faculty in the Roose-Andersen study--66 programs in electrical engineering.

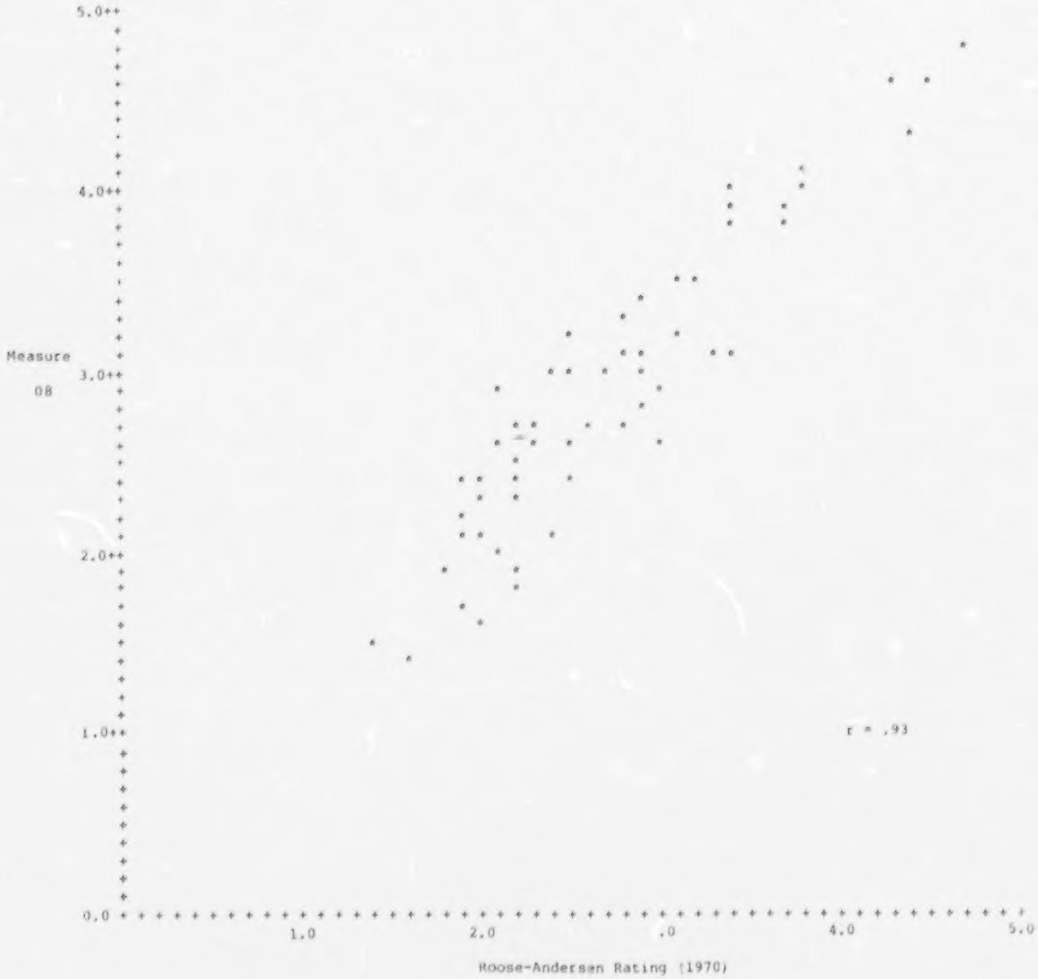

FIGURE 7.4 Mean rating of scholarly quality of faculty (measure 08) versus mean rating of faculty in the Roose-Andersen study--61 programs in mechanical engineering.

remember that the reported scores are based on the opinions of different groups of faculty members and were provided at different time periods. In 1969, when the Roose-Andersen survey was conducted, graduate departments in most universities were still expanding and not facing the enrollment and budget reductions that many departments have had to deal with in recent years. Consequently, a comparison of the overall findings from the two surveys tells us nothing about how much graduate education has improved (or declined) in the past decade. Nor should the reader place much stock in any small differences in the mean ratings that a particular program may have received in the two surveys. On the other hand, it is of particular interest to note the high correlations between the results of the evaluations. For programs in the four engineering disciplines the correlation coefficients range between .89 (chemical) and .93 (mechanical). The extraordinarily high correlations found in all four disciplines may suggest to some readers that reputational standings of programs in these disciplines have changed very little in the last decade. However, one must keep in mind that the correlations are based on the reputational ratings of only three-fourths of the programs evaluated in this assessment in these disciplines and do not take into account the emergence of many new programs that did not exist or were too small to be rated in the Roose-Andersen study.

FUTURE STUDIES

One of the most important objectives in undertaking this assessment was to test new measures not used extensively in past evaluations of graduate programs. Although the committee believes that it has been successful in this effort, much more needs to be done. First and foremost, studies of this kind should be extended to cover other types of programs and other disciplines not included in this effort. As a consequence of budgeting limitations, the committee had to restrict its study to 32 disciplines, selected on the basis of the number of doctorates awarded in each. A multidimensional assessment of research-doctorate programs in many important disciplines not included among these 32 should be of great value to the academic community. Consideration should also be given to embarking on evaluations of programs offering other types of graduate and professional degrees. As a matter of fact, plans for including master's-degree programs in this assessment were originally contemplated, but because of a lack of available information about the resources and graduates of programs at the master's level, it was decided to focus on programs leading to the research doctorate.

Perhaps the most debated issue the committee has had to address concerned which measures should be reported in this assessment. In fact, there is still disagreement among some of its members about the relative merits of certain measures, and the committee fully recognizes a need for more reliable and valid indices of the quality of graduate programs. First on a list of needs is more precise and meaningful information about the product of research-doctorate programs--the graduates. For example, what fraction of the program graduates have gone on to be productive investigators--either in the academic setting or in government and industrial laboratories? What fraction have gone on to become outstanding investigators--as measured by receipt of major prizes, membership in academies, and other such distinctions? How do program graduates compare with regard to their publication records? Also desired might be measures of the quality of the students applying for admittance to a graduate program (e.g., Graduate Record Examination scores, undergraduate grade point averages). If reliable data of this sort were made available, they might provide a useful index of the reputational standings of programs, from the perspective of graduate students.

A number of alternative measures relevant to the quality of program faculty were considered by the committee but not included in the assessment because of the associated difficulties and costs of compiling the necessary data. For example, what fraction of the program faculty were invited to present papers at national meetings? What fraction had been elected to prestigious organizations/groups in their field? What fraction had received senior fellowships and other awards of distinction? In addition, it would be highly desirable to supplement the data presented on NSF, NIH, and ADAMHA research grant awards (measure 13) with data on awards from other federal agencies (e.g., Department of Defense, Department of Energy, National Aeronautics and Space Administration) as well as from major private foundations.

As described in the preceding pages, the committee was able to make several changes in the survey design and procedures, but further improvements could be made. Of highest priority in this regard is the expansion of the survey sample to include evaluators from outside the academic setting (in particular, those in government and industrial laboratories who regularly employ graduates of the programs to be evaluated). To add evaluators from these sectors would require a major effort in identifying the survey population from which a sample could be selected. Although such an effort is likely to involve considerable costs in both time and financial resources, the committee believes that the addition of evaluators from the government and industrial settings would be of value in providing a different perspective to the reputational assessment and that comparisons between the ratings supplied by academic and nonacademic evaluators would be of particular interest.

Minority Statement

The inclusion of several different and independent possible measures reflecting the quality of graduate education in this report seems to us a substantial addition and a significant improvement to previous such studies. However, we are concerned with the possibility that there are perhaps too many measures, some of which have little or no bearing on the objectives of the present study. In particular, measures 06 and 07 (on the employment plans of graduates) are not informative, have little or nothing to do with the quality of the program, and yield numbers that are not very dependable. Both measures come from data in the NRC's Survey of Earned Doctorates. Measure 06, the fraction of FY1975-79 program graduates with definite employment or study plans at time of doctorate, is vague because the "time of doctorate" may vary considerably from the time of year when, say, academic appointments are offered--and this in turn can vary substantially among institutions. This measure may be associated with the prosperity of the program, but its connection with quality is tenuous. Measure 07, the fraction of FY1975-79 program graduates planning to take positions in Ph.D.-granting universities, is even more nebulous. What is meant by "planning"? How firm are those plans? (We can't know; all there is is a check somewhere on a questionnaire.) What about the variation in quality among different Ph.D.-granting universities? It can be considerable, and such considerable differences are precisely those that the whole study is attempting to measure. Such data obscure the differences. Further, measure 07 betrays the inherent bias of the present study and previous ones in that the "program graduates planning to take positions in Ph.D.-granting universities" is tacitly offered as a measure of the "goodness" of the program. In the late 1970's and 1980's nothing can be farther from the truth. The kindest evaluation of measures 06 and 07 is that they are irrelevant.

These two measures do not result from careful plans made by the committee for this study in order to find other useful new measures. Such plans were considered, but for various good reasons could not be carried out. These two particular measures just happen to be available in the vast data collected and recorded (but not critically evaluated) over the years by the Commission on Human Resources of the National

Research Council. Their inclusion in this report might be explained by bureaucratic inertia, but this inclusion adds nothing to the report.

The inclusion of measure 07 in this volume on research doctorates in engineering is especially meaningless. In engineering, industrial experience is clearly very valuable, so that it makes little or no sense to ask engineering graduates whether they expect to go to a "Ph.D.-granting institution." The best industrial laboratories are not likely to be busy granting doctorates. To be sure, measure 07 is here qualified as a "program characteristic." The verbiage merely hides the fact that the inclusion of this meaningless measure serves only to clutter the report with added useless numbers.

SAUNDERS MAC LANE

C. K. N. PATEL

ERNEST S. KUH

Appendixes

APPENDIX A

LETTER TO INSTITUTIONAL COORDINATORS

COMMITTEE ON AN ASSESSMENT OF QUALITY-RELATED CHARACTERISTICS
OF RESEARCH-DOCTORATE PROGRAMS IN THE UNITED STATES

Established by the Conference Board of Associated Research Councils

Office of the Staff Director / National Research Council / 2101 Constitution Avenue, N.W. / Washington, D.C. 20418

(202) 389-6552

December 5, 1980

Dear

We are pleased to learn that you have been designated to coordinate the efforts of your institution in assisting our committee with an assessment of the characteristics and effectiveness of research-doctorate programs in U.S. universities. A prospectus describing the goals and procedures for this study has already been distributed to university presidents and graduate deans. The cooperation of universities and their faculties is essential for the assessment to be carried out in an objective and accurate fashion.

The study is being conducted under the aegis of the Conference Board of Associated Research Councils and is housed administratively within the National Research Council. Financial support has been provided by the Andrew W. Mellon Foundation, the Ford Foundation, the National Science Foundation, and the National Institutes of Health. The study will examine more than 2,600 programs in 31 fields in the physical sciences, engineering, life sciences, social sciences, and humanities. Approximately 10,000 faculty members will be asked to evaluate programs in their own fields. In addition to the reputational evaluations by faculty, information will be compiled from national data banks on the achievements of both the faculty involved in each program and the program graduates.

The product of this study will be a series of reports with descriptive data on institutional programs in each of 31 fields to be covered. These reports will present several different measures of the quality-related characteristics of each program being evaluated. Some of the measures will be adjusted for program size. With the cooperation of your institution and that of other universities, we plan to produce these reports by late spring of 1982. At that time the detailed data that have

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Harriet A. Zuckerman

been compiled on research-doctorate programs within your institution will be made available to you for a nominal cost. These data should prove to be quite valuable for an assessment of the particular strengths and weaknesses of individual programs at your institution.

For the past three months the committee has deliberated over what fields are to be covered in the study and which programs within each field are to be evaluated. The financial resources available limit us to an assessment of approximately 2,600 programs in 31 fields. The fields to be included have been determined on the basis of the total number of doctorates awarded by U.S. universities during the FY1976-78 period and the feasibility of identifying and evaluating comparable programs in a particular field. Within each of the 31 fields, programs which awarded more than a specified number of doctorates during the period have been designated for inclusion in the study.

For each of the programs at your institution that are to be evaluated, we ask that you furnish the names and ranks of all faculty members who participate significantly in education toward the research doctorate, along with some basic information (as indicated) about the program itself. A set of instructions and a computer-printed roster (organized by field) are enclosed. In addition, you are given an opportunity to nominate other programs at your institution that are not on the roster, but that you believe have significant distinction and should be included in our evaluation. Any program you nominate must belong in one of the 31 fields covered by the study.

The information supplied by your institution will be used for two purposes. First, a sample of the faculty members identified with each program will be selected to evaluate research-doctorate programs in their fields at other universities. The selection will be made in such a way as to ensure that all institutional programs and faculty ranks are adequately represented in each field category. Secondly, a list of names of faculty and some of the program information you supply will be provided to evaluators selected from other institutions. Thus, it is important that you provide accurate and up-to-date information. You may wish to ask department chairmen or other appropriate persons at your institution to assist in providing the information requested. If you do so, we ask that your office coordinate the effort by collecting the information on each program and sending a single package to us in the envelope provided.

We hope that you will be able to complete this request by December 15. Should you have any questions regarding our request, please call (collect) Porter Coggeshall, the study director, at (202)389-6552. Thank you for your help in this effort.

Sincerely,

Lyle V. Jones
Lyle V. Jones
Co-Chairman

Gardner Lindzey
Gardner Lindzey
Co-Chairman

INSTRUCTIONS

General Instructions

- Provided on the first page of the accompanying roster is a list of the 31 program fields to be covered in this study. Those program fields for which you are requested to furnish information have been designated with an asterisk (*).

- For every designated field there is a separate set of roster pages. Please provide all of the information requested on these pages.

- If your institution offers more than one research-doctorate program in a designated field, we ask that you copy the roster pages furnished for that field category and provide a separate set of information for each program. For example, if your university offers one doctoral program in statistics and another in biostatistics, these should be listed separately. For this purpose, programs offered by different departments (or other administative units) that are advertised as distinct programs in your catalogues would be listed separately. Do not consider different specialty areas within a department to be separate programs.

- If your institution currently does not offer a research-doctorate program in an asterisked field or if, in your judgment, a doctoral program offered fails to fit the designated field category, please so indicate on the roster pages provided for that field.

List of Faculty Members (as of December 1, 1980)

- On each program roster please provide the names of faculty members who participate significantly in doctoral education.

- Included should be individuals who (a) are members of the regular academic faculty (typically holding the rank of assistant, associate, or full professor) and (b) regularly teach doctoral students and/or serve on doctoral committees.

- Members of the faculty who are currently on leave of absence but meet the above criteria should be included.

- Visiting faculty members should not be included.

- Emeritus or adjunct faculty members (or faculty with other comparable ranks) should also be excluded unless they currently participate significantly in doctoral education.

- Members of the faculty who participate significantly in doctoral education in more than one program should be listed on the roster for each program in which they participate.

- In many instances the list of faculty for a program may be identical to an institutional list of graduate faculty.

- Faculty names should be provided in the form in which they are most likely to be recognized by colleagues in the field. We prefer that, within each academic rank, you list faculty alphabetically by last name.

Nomination of Faculty to Serve as Program Evaluators
(Column 3 of Faculty Roster)

- Please check the names of at least two faculty members in each academic rank within each program who would be available and, in your opinion, well-qualified to evaluate research-doctorate programs in their field.

- A sample of evaluators will be selected from the list of faculty you provide for each program. In selecting evaluators preference will be given to those whose names you have checked. If no names are checked, a random sample will be selected from the faculty list.

Faculty Who Do Not Hold Ph.D. Degrees From U.S. Universities
(Column 4 of Faculty Roster)

- In order to help us match the faculty names you provide with records in the Doctorate Records File (maintained by the National Research Council), we ask that you identify those faculty members who do not hold a Ph.D. or equivalent research-doctorate from a university in the United States.

- This information will be used only for the purposes of collating records and will not be released to those who are selected to evaluate your institution's programs. Nor will this information affect in any way the selection of program evaluators from your institution's faculty.

Nomination of Additional Programs

- We recognize the possibility that we may have omitted one or more research-doctorate programs at your institution that belong to (non-asterisked) fields listed on the first page of the roster and that you believe should be included in this study.

- The last two pages of the accompanying roster are provided for the nomination of an additional program. You are asked to provide the names of faculty and other information about each program you nominate. Should you decide to nominate more than one program, it will be necessary to make additional copies of these two pages of the roster.

- Please restrict your nominations to programs in your institution that you consider to be of uncommon distinction and that have awarded no fewer than two doctorates during the past two years.

- Only programs which fall under one of the 31 field categories listed on the first page of the accompanying roster will be considered for inclusion in the study.

PLEASE RETURN COMPLETED ROSTER IN
THE ENCLOSED ENVELOPE TO:

COMMITTEE ON AN ASSESSMENT OF
QUALITY-RELATED CHARACTERISTICS
OF RESEARCH-DOCTORATE PROGRAMS
NATIONAL RESEARCH COUNCIL, JH-711
2101 CONSTITUTION AVENUE, N.W.
WASHINGTON, D.C. 20418

FIELDS INCLUDED IN THE STUDY

ARTS AND HUMANITIES

- * ART HISTORY
- * CLASSICS
- * ENGLISH LANGUAGE AND LITERATURE
- * FRENCH LANGUAGE AND LITERATURE
- * GERMAN LANGUAGE AND LITERATURE
- LINGUISTICS
- MUSIC
- * PHILOSOPHY
- * SPANISH AND PORTUGUESE LANGUAGE AND LITERATURE

BIOLOGICAL SCIENCES

- * BIOCHEMISTRY
- BOTANY (INCLUDING PLANT PHYSIOLOGY, PLANT PATHOLOGY, MYCOLOGY)
- * CELLULAR BIOLOGY/MOLECULAR BIOLOGY
- * MICROBIOLOGY (INCLUDING IMMUNOLOGY, BACTERIOLOGY, PARASITOLOGY, VIROLOGY)
- * PHYSIOLOGY (ANIMAL, HUMAN)
- ZOOLOGY

ENGINEERING

- * CHEMICAL ENGINEERING
- * CIVIL ENGINEERING
- * ELECTRICAL ENGINEERING
- * MECHANICAL ENGINEERING

PHYSICAL SCIENCES

- * CHEMISTRY
- * COMPUTER SCIENCES
- * GEOSCIENCES (INCLUDING GEOLOGY, GEOCHEMISTRY, GEOPHYSICS, GENL EARTH SCI)
- * MATHEMATICS
- * PHYSICS (EXCLUDING ASTRONOMY, ASTROPHYSICS)
- STATISTICS (INCLUDING BIOSTATISTICS)

SOCIAL AND BEHAVIORAL SCIENCES

- * ANTHROPOLOGY
- * ECONOMICS
- * HISTORY
- * POLITICAL SCIENCE
- * PSYCHOLOGY
- * SOCIOLOGY

* DESIGNATES FIELDS FOR WHICH YOU ARE REQUESTED TO PROVIDE INFORMATION ON RESEARCH-DOCTORATE PROGRAMS IN YOUR INSTITUTION. (SEE INSTRUCTION SHEET REGARDING NOMINATION OF ADDITIONAL PROGRAMS TO BE INCLUDED IN THE STUDY).

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**************************************************
***                                - PART A   ***
**************************************************
```

PLEASE ANSWER EACH OF THE FOLLOWING QUESTIONS ABOUT THE RESEARCH-DOCTORATE PROGRAM

IN ______________________________

(1) WHAT IS THE NAME OF THE DEPARTMENT (OR EQUIVALENT ACADEMIC UNIT) IN WHICH THIS RESEARCH-DOCTORATE PROGRAM IS OFFERED ?

....

(2) HOW MANY PH.D.'S (OR EQUIVALENT RESEARCH-DOCTORATES) HAVE BEEN AWARDED IN THE PROGRAM IN EACH OF THE LAST FIVE ACADEMIC YEARS ?

1975-76 ....

1976-77 ....

1977-78 ....

1978-79 ....

1979-80 ....

(3) APPROXIMATELY HOW MANY FULL-TIME AND PART-TIME GRADUATE STUDENTS ENROLLED IN THE PROGRAM AT THE PRESENT TIME (FALL 1980) INTEND TO EARN DOCTORATES ?

FULL-TIME STUDENTS ....

PART-TIME STUDENTS ....

TOTAL ....

(4) IN APPROXIMATELY WHAT YEAR WAS THIS RESEARCH-DOCTORATE PROGRAM INITIATED ? (IF PROGRAM WAS DISCONTINUED AND SUBSEQUENTLY REINSTATED, PLEASE GIVE YEAR IT WAS REINSTATED) .

....

****
*** _   - PART B ***
****

(1) LIST BELOW ALL FACULTY WHO PARTICIPATE SIGNIFICANTLY IN DOCTORAL EDUCATION IN THIS PROGRAM (SEE INSTRUCTIONS SHEET). PLEASE PRINT OR TYPE NAMES IN FOLLOWING FORMAT: EXAMPLE: MARY A. JONES A. B. SMITH, JR.	(2) INDICATE THE ACADEMIC RANK OF EACH FACULTY MEMBER (PROF., ASSOC. PROF., ASST. PROF., ETC.).	(3) CHECK BELOW AT LEAST 2 FACULTY IN EACH RANK AVAILABLE AND WELL-QUALIFIED TO EVALUATE OTHER PROGRAMS (SEE INSTRUCTIONS SHEET).	(4) CHECK BELOW ANY FACULTY WHO DO NOT HOLD A PH.D. OR OTHER RESEARCH-DOCTORATE FROM A UNIVERSITY IN THE U.S. (SEE INSTRUCTIONS SHEET).
01	..	( )	( )
02	..	( )	( )
03	..	( )	( )
04	..	( )	( )
05	..	( )	( )
06	..	( )	( )
07	..	( )	( )
08	..	( )	( )
09	..	( )	( )
10	..	( )	( )
11	..	( )	( )
12	..	( )	( )
13	..	( )	( )
14	..	( )	( )
15	..	( )	( )
16	..	( )	( )
17	..	( )	( )
18	..	( )	( )
19	..	( )	( )
20	..	( )	( )

(PART B CONTINUED ON NEXT PAGE)

APPENDIX B

SURVEY OF EARNED DOCTORATES

(Conducted by the National Research Council under the sponsorship of the National Science Foundation, the Department of Education, the National Institutes of Health, and the National Endowment for the Humanities.)

This annual survey of new recipients of Ph.D. or equivalent research doctorates in all fields of learning contains information describing their demographic characteristics, educational background, graduate training, and postgraduation plans. The source file includes nearly complete data from all 1958-81 doctorate recipients and partial information for all 1920-57 doctoral graduates.

NSF Form 558 1977
OMB No 99-R0290
Approval Expires June 30, 1979

SURVEY OF EARNED DOCTORATES

This form is to be returned to the GRADUATE DEAN, for forwarding to .... Board on Human-Resource Data and Analyses
Commission on Human Resources
National Research Council
2101 Constitution Avenue, Washington, D. C. 20418

Please print or type.

A. **Name in full:** .... (Last Name) (First Name) (Middle Name) (9-30)

Cross Reference: Maiden name or former name legally changed .... (31)

B. **Permanent address through which you could always be reached:** (Care of, if applicable) ....

.... (Number) (Street) (City)

.... (State) (Zip Code) (Or Country if not U.S.)

C. **U.S. Social Security Number:** _ _ _ - _ _ - _ _ _ _ (32-40)

D. **Date of birth:** (41-45) .... (Month) (Day) (Year) **Place of birth:** (46-47) .... (State) (Or Country if not U.S.)

E. **Sex:** 1 ☐ Male 2 ☐ Female (48)

F. **Marital status:** 1 ☐ Married 2 ☐ Not married (including widowed, divorced) (49)

G. **Citizenship:**
0 ☐ U.S. native 2 ☐ Non U.S., Immigrant (Permanent Resident)
1 ☐ U.S. naturalized 3 ☐ Non-U.S., Non-Immigrant (Temporary Resident) (50)
If Non-U.S., indicate country of present citizenship .... (51-52)

H. **Racial or ethnic group:** (Check all that apply.) *A person having origins in --*
0 ☐ American Indian or Alaskan Native ..... any of the original peoples of North America, and who maintain cultural identification through tribal affiliation or community recognition.
1 ☐ Asian or Pacific Islander .... any of the original peoples of the Far East, Southeast Asia, the Indian Subcontinent, or the Pacific Islands. This area includes, for example, China, Japan, Korea, the Philippine Islands, and Samoa.
2 ☐ Black, not of Hispanic Origin .... any of the black racial groups of Africa.
3 ☐ White, not of Hispanic Origin .... any of the original peoples of Europe, North Africa, or the Middle East.
4 ☐ Hispanic .... Mexican, Puerto Rican, Central or South American, or other Spanish culture or origins, regardless of race. (53-55)

I. **Number of dependents:** Do not include yourself. (Dependent = someone receiving at least one half of his or her support from you) ....(56)

J. **U.S. veteran status:** 0 ☐ Veteran 1 ☐ On active duty 2 ☐ Non-veteran or not applicable (57)

EDUCATION

K. **High school last attended:** .... (School Name) (City) (State) (58-59)

Year of graduation from high school: .... (60-61)

L. List in the table below all collegiate and graduate institutions you have attended including 2-year colleges. List chronologically, and include your doctoral institution as the last entry.

Institution Name	Location	Years Attended		Major Field		Minor Field	Degree (if any)		
		From	To	Use Specialties List			Title of Degree	Granted	
				Name	Number	Number		Mo.	Yr.

M. Enter below the title of your doctoral dissertation and the most appropriate classification number and field. If a project report or a musical or literary composition (not a dissertation) is a degree requirement, please check box. ☐ (44)

Title ....
....
....

Classify using Specialties List
Number .... Name of field ....

N. **Name the department (or interdisciplinary committee, center, institute, etc.) and school or college of the university which supervised your doctoral program:** .... (Department/Institute/Committee/Program) (School)

O. **Name of your dissertation adviser:** .... (Last Name) (First Name) (Middle Initial)

continued on next page

SURVEY OF EARNED DOCTORATES, Cont.

P. Please enter a "1" beside your primary source of support during graduate study. Enter a "2" beside your secondary source of support during graduate study. Check all other sources from which support was received.

58 ___ NSF Fellowship
59 ___ NSF Traineeship
60 ___ NIH Fellowship
61 ___ NIH Traineeship
62 ___ NDEA Fellowship
63 ___ Other HEW
64 ___ AEC/ERDA Fellowship
65 ___ NASA Traineeship
66 ___ GI Bill
67 ___ Other Federal support (specify) ....
68 ___ Woodrow Wilson Fellowship
69 ___ Other U.S. national fellowship (specify) ....
70 ___ University Fellowship
71 ___ Teaching Assistantship
72 ___ Research Assistantship
73 ___ Educational fund of industrial or business firm
74 ___ Other institutional funds (specify) ....
75 ___ Own earnings
76 ___ Spouse's earnings
77 ___ Family contributions
78 ___ Loans (NDSL direct)
79 ___ Other loans
80 ___ Other (specify) ....

Q Please check the space which most fully describes your status during the year immediately preceding the doctorate.

0 ☐ Held fellowship
1 ☐ Held assistantship
2 ☐ Held own research grant
3 ☐ Not employed
4 ☐ Part-time employed

Full-time Employed in: (Other than 0, 1, 2)
5 ☐ College or university, teaching
6 ☐ College or university, non-teaching
7 ☐ Elem. or sec. school, teaching
8 ☐ Elem. or sec. school, non-teaching
9 ☐ Industry or business
(11) ☐ Other (specify) ....

(12) ☐ Any other (specify) .... (9)

R. How many years (full-time equivalent basis) of professional work experience did you have prior to the doctorate? (include assistantships as professional experience) .... (10-11)

POSTGRADUATION PLANS

S. How well defined are your postgraduation plans?
0 ☐ Have signed contract or made definite commitment
1 ☐ Am negotiating with a specific organization, or more than one
2 ☐ Am seeking appointment but have no specific prospects
3 ☐ Other (specify) .... (12)

T. What are your immediate postgraduation plans?
0 ☐ Postdoctoral fellowship?
1 ☐ Postdoctoral research associateship?
2 ☐ Traineeship?
3 ☐ Other study (specify) ....
Go to Item "U"
4 ☐ Employment (other than 0, 1, 2, 3)
5 ☐ Military service?
6 ☐ Other (specify).................... (13)
Go to Item "V"

U. If you plan to be on a postdoctoral fellowship, associateship, traineeship or other study

What will be the field of your postdoctoral study?
Classify using Specialties List.
Number .... Field .... (14-16)

What will be the primary source of support?
0 ☐ U.S. Government
1 ☐ College or university
2 ☐ Private foundation
3 ☐ Nonprofit, other than private foundation
4 ☐ Other (specify) .... (17)
6 ☐ Unknown

Go to Item "W"

V. If you plan to be employed, enter military service, or other – What will be the type of employer?
0 ☐ 4-year college or university other than medical school
1 ☐ Medical school
2 ☐ Jr. or community college
3 ☐ Elem. or sec. school
4 ☐ Foreign government
5 ☐ U.S. Federal government
6 ☐ U.S. state government
7 ☐ U.S. local government
8 ☐ Nonprofit organization
9 ☐ Industry or business
(11) ☐ Self-employed
(12) ☐ Other (specify) .... (18)

Indicate *primary* work activity with "1" in appropriate box; *secondary* work activity (if any) with "2" in appropriate box.
0 ☐ Research and development
1 ☐ Teaching
2 ☐ Administration
3 ☐ Professional services to individuals
5 ☐ Other (specify).................... (19-20)

In what field will you be working?
Please enter number from Specialties List .... (21-23)

Go to Item "W"

W. What is the name and address of the organization with which you will be associated?

....
(Name of Organization)

.... (Street) .... (City, State) (Or Country if not U.S.) (24-29)

BACKGROUND INFORMATION

X. Please indicate, by circling the highest grade attained, the education of

your father:	none	1 2 3 4 5 6 7 8	9 10 11 12	1 2 3 4	MA, MD PhD	Postdoctoral	(30)
		Elementary school	High school	College	Graduate		
your mother	none	1 2 3 4 5 6 7 8	9 10 11 12	1 2 3 4	MA, MD PhD	Postdoctoral	(31)
	0	1 2 3	4 5	6 7	8 9	(11)	

Signature .... Date completed .... (32-34)

APPENDIX C

LETTER TO EVALUATORS

COMMITTEE ON AN ASSESSMENT OF QUALITY-RELATED CHARACTERISTICS
OF RESEARCH-DOCTORATE PROGRAMS IN THE UNITED STATES
Established by the Conference Board of Associated Research Councils
Office of the Staff Director / National Research Council / 2101 Constitution Avenue, N.W. / Washington, D.C. 20418

April 14, 1981

Dear

As you may already know, our committee has undertaken an assessment of research-doctorate programs in U.S. universities. The study is examining approximately 2,650 programs in 31 fields in the arts and humanities, biological sciences, engineering, physical and mathematical sciences, and social sciences. A study prospectus is provided on the reverse of this page. You have been selected from a faculty list furnished by your institution to evaluate programs offering research-doctorates in the field of Chemical Engineering.

On the first page of the attached form is a list of the 145 programs that are being evaluated in this field. These programs produce more than 90 percent of the doctorate recipients in the field. In order to keep the task manageable, you are being asked to consider a randomly selected subset of 50 of these programs. These are designated with an asterisk in the list on the next page and are presented in random sequence on the evaluation sheets that follow. Please read the accompanying instructions carefully before attempting your evaluations.

We ask that you complete the attached survey form and return it in the enclosed envelope within the next three weeks. The evaluations you and your colleagues render will constitute an important component of this study. Your prompt attention to this request will be very much appreciated by our committee.

Sincerely,

Gardner Lindzey

Lyle Jones
For the Study Committee

Enclosures

COMMITTEE MEMBERS

Lyle V. Jones, Co-Chairman
Gardner Lindzey, Co-Chairman
Paul A. Albrecht
Marcus Alexis
Robert M. Bock
Philip E. Converse
James H. M. Henderson
Ernest S. Kuh
Winfred P. Lehmann
Saunders Mac Lane
Nancy S. Milburn
Lincoln E. Moses
James C. Olson
Kumar Patel
Michael J. Pelczar, Jr.
Jerome B. Schneewind
Duane C. Spriestersbach
Harriet A. Zuckerman

RESEARCH-DOCTORATE PROGRAMS IN THE FIELD OF CHEMICAL ENGINEERING
(* DESIGNATES THE PROGRAMS WHICH YOU ARE ASKED TO EVALUATE ON THE FOLLOWING PAGES.)

INSTITUTION - DEPARTMENT/ACADEMIC UNIT

UNIVERSITY OF AKRON - CHEMICAL ENGINEERING
* AUBURN UNIVERSITY - CHEMICAL ENGINEERING
* BRIGHAM YOUNG UNIVERSITY - CHEMICAL ENGINEERING
CALIFORNIA INSTITUTE OF TECHNOLOGY - CHEMICAL ENGINEERING
* UNIVERSITY OF CALIFORNIA, BERKELEY - CHEMICAL ENGINEERING
* UNIVERSITY OF CALIFORNIA, LOS ANGELES - ENGINEERING AND APPLIED SCIENCE
* CARNEGIE-MELLON UNIVERSITY - CHEMICAL ENGINEERING
CASE WESTERN RESERVE UNIVERSITY - CHEMICAL ENGINEERING
CATHOLIC UNIVERSITY OF AMERICA - CHEMICAL ENGINEERING
UNIVERSITY OF CINCINNATI - CHEMICAL ENGINEERING
CUNY, THE GRADUATE SCHOOL - ENGINEERING
CLARKSON COLLEGE OF TECHNOLOGY - CHEMICAL ENGINEERING
* CLEMSON UNIVERSITY - CHEMICAL ENGINEERING
UNIVERSITY OF COLORADO, BOULDER - CHEMICAL ENGINEERING
* COLUMBIA UNIV-GRAD SCHOOL OF ARTS & SCI - CHEMICAL ENGINEERING AND APPLIED CHEMISTRY
* UNIVERSITY OF CONNECTICUT, STORRS - CHEMICAL ENGINEERING
* CORNELL UNIVERSITY, ITHACA - CHEMICAL ENGINEERING
* UNIVERSITY OF DELAWARE, NEWARK - CHEMICAL ENGINEERING
* GEORGIA INSTITUTE OF TECHNOLOGY - CHEMICAL ENGINEERING
* UNIVERSITY OF HOUSTON - CHEMICAL ENGINEERING
* UNIVERSITY OF IDAHO, MOSCOW - CHEMICAL ENGINEERING
* ILLINOIS INSTITUTE OF TECHNOLOGY - CHEMICAL ENGINEERING
* UNIV OF ILLINOIS AT URBANA-CHAMPAIGN - CHEMICAL ENGINEERING
IOWA STATE UNIVERSITY, AMES - CHEMICAL ENGINEERING
* KANSAS STATE UNIVERSITY, MANHATTAN - CHEMICAL ENGINEERING
* UNIVERSITY OF KANSAS - CHEMICAL AND PETROLEUM ENGINEERING
* UNIVERSITY OF KENTUCKY - CHEMICAL ENGINEERING
LEHIGH UNIVERSITY - CHEMICAL ENGINEERING
* LOUISIANA STATE UNIVERSITY, BATON ROUGE - CHEMICAL ENGINEERING
* UNIVERSITY OF MARYLAND, COLLEGE PARK - CHEMICAL AND NUCLEAR ENGINEERING
MASSACHUSETTS INSTITUTE OF TECHNOLOGY - CHEMICAL ENGINEERING
* UNIVERSITY OF MASSACHUSETTS, AMHERST - CHEMICAL ENGINEERING
MICHIGAN STATE UNIVERSITY, EAST LANSING - CHEMICAL ENGINEERING
UNIVERSITY OF MICHIGAN, ANN ARBOR - CHEMICAL ENGINEERING
* UNIVERSITY OF MINNESOTA - CHEMICAL ENGINEERING AND MATERIALS SCIENCE
* UNIVERSITY OF MISSOURI, COLUMBIA - CHEMICAL ENGINEERING
* UNIVERSITY OF MISSOURI, ROLLA - CHEMICAL ENGINEERING
MONTANA STATE UNIVERSITY, BOZEMAN - CHEMICAL ENGINEERING
* NEW JERSEY INSTITUTE OF TECHNOLOGY - CHEMISTRY AND CHEMICAL ENGINEERING
NORTH CAROLINA STATE UNIVERSITY, RALEIGH - CHEMICAL ENGINEERING
* NORTHWESTERN UNIVERSITY - CHEMICAL ENGINEERING
* UNIVERSITY OF NOTRE DAME - CHEMICAL ENGINEERING
* OHIO STATE UNIVERSITY - CHEMICAL ENGINEERING
* OKLAHOMA STATE UNIVERSITY, STILLWATER - CHEMICAL ENGINEERING
* UNIVERSITY OF OKLAHOMA - CHEMICAL ENGINEERING AND MATERIALS SCIENCE
* OREGON STATE UNIVERSITY, COVALLIS - CHEMICAL ENGINEERING
* PENNSYLVANIA STATE UNIVERSITY - CHEMICAL ENGINEERING
* UNIVERSITY OF PENNSYLVANIA - CHEMICAL ENGINEERING
* UNIVERSITY OF PITTSBURGH - CHEMICAL AND PETROLEUM ENGINEERING
POLYTECHNIC INSTITUTE OF NEW YORK - CHEMICAL ENGINEERING
PRINCETON UNIVERSITY - CHEMICAL ENGINEERING
PURDUE UNIVERSITY, WEST LAFAYETTE - CHEMICAL ENGINEERING
RENSSELAER POLYTECHNIC INSTITUTE - CHEMICAL AND ENVIRONMENTAL ENGINEERING
* UNIVERSITY OF RHODE ISLAND - CHEMICAL ENGINEERING
RICE UNIVERSITY - CHEMICAL ENGINEERING
* UNIVERSITY OF ROCHESTER - CHEMICAL ENGINEERING
* RUTGERS UNIVERSITY, NEW BRUNSWICK - CHEMICAL AND BIOCHEMICAL ENGINEERING
UNIVERSITY OF SOUTHERN CALIFORNIA - CHEMICAL ENGINEERING
STANFORD UNIVERSITY - CHEMICAL ENGINEERING
UNIVERSITY OF FLORIDA, GAINESVILLE - CHEMICAL ENGINEERING
* SUNY AT BUFFALO - CHEMICAL ENGINEERING
* STEVENS INSTITUTE OF TECHNOLOGY - CHEMISTRY/CHEMICAL ENGINEERING
SYRACUSE UNIVERSITY - CHEMICAL ENGINEERING AND MATERIALS SCIENCE
* SUNY, COL OF ENVIR SCI & FORESTRY (SYRACUSE) - PAPER SCIENCE AND ENGINEERING
* UNIVERSITY OF TENNESSEE, KNOXVILLE - CHEMICAL, METALLURGICAL, AND POLYMER ENGINEERING
TEXAS A&M UNIVERSITY - CHEMICAL ENGINEERING
UNIVERSITY OF TEXAS, AUSTIN - CHEMICAL ENGINEERING
* TULANE UNIVERSITY - CHEMICAL ENGINEERING
* UNIVERSITY OF TULSA - CHEMICAL ENGINEERING
* UNIVERSITY OF UTAH, SALT LAKE CITY - CHEMICAL ENGINEERING
VANDERBILT UNIVERSITY - CHEMICAL ENGINEERING
UNIVERSITY OF VIRGINIA - CHEMICAL ENGINEERING
* WASHINGTON UNIVERSITY (ST LOUIS) - CHEMICAL ENGINEERING

* UNIVERSITY OF WASHINGTON, SEATTLE - CHEMICAL ENGINEERING
* WAYNE STATE UNIVERSITY - CHEMICAL ENGINEERING
* WEST VIRGINIA UNIVERSITY - CHEMICAL ENGINEERING
* UNIVERSITY OF WISCONSIN, MADISON - CHEMICAL ENGINEERING
* WORCESTER POLYTECHNIC INSTITUTE - CHEMICAL ENGINEERING
YALE UNIVERSITY - ENGINEERING AND APPLIED SCIENCE

INSTRUCTIONS

At the top of the next page please provide the information requested on the highest degree you hold and your current field of specialization. You may be assured that all information you furnish on the survey form is to be used for purposes of statistical description only and that the confidentiality of your responses will be protected.

On the pages that follow you are asked to judge 50 programs (presented in random sequence) that offer the research-doctorate. Each program is to be evaluated in terms of: (1) scholarly quality of program faculty; (2) effectiveness of program in educating research scholars/scientists; and (3) change in program quality in the last five years (see below). Although the assessment is limited to these factors, our committee recognizes that other factors are relevant to the quality of doctoral programs, and that graduate programs serve important purposes in addition to that of educating doctoral candidates.

A list of the faculty members signficantly involved in each program, the name of the academic unit in which the program is offered, and the number of doctorates awarded in that program during the last five years have been printed on the survey form (whenever available). Although this information has been furnished to us by the institution and is believed to be accurate, it has not been verified by our study committee and may have a few omissions, misspellings, or other errors.

Before marking your responses on the survey form, you may find it helpful to look over the full set of programs you are being asked to evaluate. In making your judgments about each program, please keep in mind the following instructions:

(1) Scholarly Quality of Program Faculty. Check the box next to the term that most closely corresponds to your judgment of the quality of faculty in the research-doctorate program described. Consider only the scholarly competence and achievements of the faculty. It is suggested that no more than five programs be designated "distinguished."

(2) Effectiveness of Program in Educating Research Scholars/Scientists. Check the box next to the term that most closely corresponds to your judgment of the doctoral program's effectiveness in educating research scholars/scientists. Consider the accessibility of the faculty, the curricula, the instructional and research facilities, the quality of graduate students, the performance of the graduates, and other factors that contribute to the effectiveness of the research-doctorate program.

(3) Change in Program Quality in Last Five Years. Check the box next to the term that most closely corresponds to your estimate of the change that has taken place in the research-doctorate program in the last five years. Consider both the scholarly quality of the program faculty and the effectiveness of the program in educating research scholars/scientists. Compare the quality of the program today with its quality five years ago--not the change in the program's relative standing among other programs in the field.

In assessing each of these factors, mark the category "Don't know well enough to evaluate" if you are unfamiliar with that aspect of the program. It is quite possible that for some programs you may be knowledgeable about the scholarly quality of the faculty, but not about the effectiveness of the program or change in program quality.

For each of the programs identified, you are also asked to indicate the extent to which you are familiar with the work of members of the program faculty. For example, if you recognize only a very small fraction of the faculty, you should mark the category "Little or no familiarity."

Please be certain that you have provided a set of responses for each of the programs identified on the following pages. The fully completed survey form should be returned in the enclosed envelope to:

Committee on an Assessment of Quality-Related
Characteristics of Research-Doctorate Programs
National Research Council, JH-638
2101 Constitution Avenue, N.W.
Washington, D.C. 20418

Our committee will be most appreciative of your thoughtful assessment of these research-doctorate programs. We welcome any comments you may wish to append to the completed survey form.

PLEASE PROVIDE THE FOLLOWING INFORMATION: **FORM NO. 3606-75**

HIGHEST DEGREE YOU HOLD: ( ) PH.D. ( ) OTHER (PLEASE SPECIFY) ____________________

YEAR OF HIGHEST DEGREE: __ ______

INSTITUTION OF HIGHEST DEGREE ____________________

YOUR CURRENT FIELD OF SPECIALIZATION (CHECK ONLY ONE)

A ( ) AERO-/ASTRONAUTICAL ENGR
B ( ) AGRICULTURAL ENGINEERING
C ( ) BIOMEDICAL ENGINEERING
D ( ) CHEMICAL ENGINEERING
E ( ) CIVIL ENGINEERING
F ( ) COMPUTER ENGINEERING
G ( ) ELECTRICAL ENGINEERING
H ( ) ELECTRONICS
I ( ) ENGINEERING MECHANICS
J ( ) INDUSTRIAL ENGINEERING
K ( ) MATERIALS SCIENCE
L ( ) MECHANICAL ENGINEERING
M ( ) METALLURGY
N ( ) NUCLEAR ENGINEERING
O ( ) OPERATIONS RESEARCH
P ( ) PETROLEUM ENGINEERING
Q ( ) SANITARY/ENVIRONMENTAL ENGR
R ( ) SYSTEMS DESIGN/SYSTEMS SCIENCE
S ( ) ENGINEERING, GENERAL
T ( ) OTHER (PLEASE SPECIFY)

____

INSTITUTION: **UNIVERSITY OF MISSOURI, ROLLA** **FORM NO. 3606-01**
DEPARTMENT/ACADEMIC UNIT: **CHEMICAL ENGINEERING**
TOTAL DOCTORATES AWARDED 1976-80: 15

PROFESSORS: David AZBEL, Orrin K. CROSSER, Marshall E. FINDLEY, James W. JOHNSON, Gary K. PATTERSON, X. B. REED Jr, Raymond C. WAGGONER, H. K. YASUDA

ASSOCIATE PROFESSORS: A. I. LIAPIS, David B. MANLEY, Robert A. MOLLENKAMP, Bruce E. POLING

ASSISTANT PROFESSORS: Neil L. BOOK, Partho NEOGI, Oliver C. SITTON

SCHOLARLY QUALITY OF PROGRAM FACULTY

1. ( ) *DISTINGUISHED*
2. ( ) *STRONG*
3. ( ) *GOOD*
4. ( ) *ADEQUATE*
5. ( ) *MARGINAL*
6. ( ) *NOT SUFFICIENT FOR DOCTORAL EDUCATION*

0. ( ) *DON'T KNOW WELL ENOUGH TO EVALUATE*

FAMILIARITY WITH WORK OF PROGRAM FACULTY

1. ( ) *CONSIDERABLE FAMILIARITY*
2. ( ) *SOME FAMILIARITY*
3. ( ) *LITTLE OR NO FAMILIARITY*

EFFECTIVENESS OF PROGRAM IN EDUCATING RESEARCH SCHOLARS/SCIENTISTS

1. ( ) *EXTREMELY EFFECTIVE*
2. ( ) *REASONABLY EFFECTIVE*
3. ( ) *MINIMALLY EFFECTIVE*
4. ( ) *NOT EFFECTIVE*

0. ( ) *DON'T KNOW WELL ENOUGH TO EVALUATE*

CHANGE IN PROGRAM QUALITY IN LAST FIVE YEARS

1. ( ) *BETTER THAN FIVE YEARS AGO*
2. ( ) *LITTLE OR NO CHANGE IN LAST FIVE YEAR*
3. ( ) *POORER THAN FIVE YEARS AGO*

0. ( ) *DON'T KNOW WELL ENOUGH TO EVALUATE*

INSTITUTION: UNIVERSITY OF OKLAHOMA **FORM NO. 3606-02**
DEPARTMENT/ACADEMIC UNIT: CHEMICAL ENGINEERING AND MATERIALS SCIENCE
TOTAL DOCTORATES AWARDED 1976-80: 16

PROFESSORS: Arthur William ALDAG Jr, Robert Jay BLOCK, Alfred CLARK, Raymond Deweitt DANIELS, Carl Edwin LOCKE, Cedomir M. SLIEPCEVICH, Kenneth Earl STARLING, Francis Mark TOWNSEND, William Reid UPTHEGROVE

ASSOCIATE PROFESSORS: John Michael RADOVICH, Samir Salim SOFER

ASSISTANT PROFESSORS: Lloyd L. LEE

SCHOLARLY QUALITY OF PROGRAM FACULTY

1. ( ) *DISTINGUISHED*
2. ( ) *STRONG*
3. ( ) *GOOD*
4. ( ) *ADEQUATE*
5. ( ) *MARGINAL*
6. ( ) *NOT SUFFICIENT FOR DOCTORAL EDUCATION*

0. ( ) *DON'T KNOW WELL ENOUGH TO EVALUATE*

FAMILIARITY WITH WORK OF PROGRAM FACULTY

1. ( ) *CONSIDERABLE FAMILIARITY*
2. ( ) *SOME FAMILIARITY*
3. ( ) *LITTLE OR NO FAMILIARITY*

EFFECTIVENESS OF PROGRAM IN EDUCATING RESEARCH SCHOLARS/SCIENTISTS

1. ( ) *EXTREMELY EFFECTIVE*
2. ( ) *REASONABLY EFFECTIVE*
3. ( ) *MINIMALLY EFFECTIVE*
4. ( ) *NOT EFFECTIVE*

0. ( ) *DON'T KNOW WELL ENOUGH TO EVALUATE*

CHANGE IN PROGRAM QUALITY IN LAST FIVE YEARS

1. ( ) *BETTER THAN FIVE YEARS AGO*
2. ( ) *LITTLE OR NO CHANGE IN LAST FIVE YEAR*
3. ( ) *POORER THAN FIVE YEARS AGO*

0. ( ) *DON'T KNOW WELL ENOUGH TO EVALUATE*

INSTITUTION: OKLAHOMA STATE UNIVERSITY, STILLWATER **FORM NO. 3606-03**
DEPARTMENT/ACADEMIC UNIT: CHEMICAL ENGINEERING
TOTAL DOCTORATES AWARDED 1976-80: 15

PROFESSORS: K. J. BELL, B. L. CRYNES, J. H. ERBAR, R. N. MADDOX, R. L. ROBINSON

ASSISTANT PROFESSORS: G. L. FOUTCH, A. G. HILL, M. T. JAHANGIRIANS, J. WAGNER

SCHOLARLY QUALITY OF PROGRAM FACULTY

1. ( ) *DISTINGUISHED*
2. ( ) *STRONG*
3. ( ) *GOOD*
4. ( ) *ADEQUATE*
5. ( ) *MARGINAL*
6. ( ) *NOT SUFFICIENT FOR DOCTORAL EDUCATION*

0. ( ) *DON'T KNOW WELL ENOUGH TO EVALUATE*

FAMILIARITY WITH WORK OF PROGRAM FACULTY

1. ( ) *CONSIDERABLE FAMILIARITY*
2. ( ) *SOME FAMILIARITY*
3. ( ) *LITTLE OR NO FAMILIARITY*

EFFECTIVENESS OF PROGRAM IN EDUCATING RESEARCH SCHOLARS/SCIENTISTS

1. ( ) *EXTREMELY EFFECTIVE*
2. ( ) *REASONABLY EFFECTIVE*
3. ( ) *MINIMALLY EFFECTIVE*
4. ( ) *NOT EFFECTIVE*

0. ( ) *DON'T KNOW WELL ENOUGH TO EVALUATE*

CHANGE IN PROGRAM QUALITY IN LAST FIVE YEARS

1. ( ) *BETTER THAN FIVE YEARS AGO*
2. ( ) *LITTLE OR NO CHANGE IN LAST FIVE YEAR*
3. ( ) *POORER THAN FIVE YEARS AGO*

0. ( ) *DON'T KNOW WELL ENOUGH TO EVALUATE*

APPENDIX D

THE ARL LIBRARY INDEX

(SOURCE: Mandel, Carol A., and Mary P. Johnson, ARL Statistics 1979-80, Association of Research Libraries, Washington, D.C., 1980, pp. 23-24.)

The data tables at the beginning of the ARL Statistics display figures reported by ARL member libraries in 22 categories that, with the exception of the measures of interlibrary loan activity, describe the size of ARL libraries in terms of holdings, expenditures, and personnel. The rank order tables provide an overview of the ranges and medians for 14 of these categories, or variables, among ARL academic libraries as well as quantitatively comparing each library with other ARL member institutions. However, none of the 22 variables provides a summary measure of a library's relative size within ARL or characterizes the ARL libraries as a whole.

The ARL Library Index has been derived as a means of providing this summary characterization, permitting quantitative comparisons of ARL academic libraries, singly and as a group, with other academic libraries. Through the use of statistical techniques known as factor analysis, it can be determined that 15 of the variables reported to ARL are more closely correlated with each other than with other categories. Within this group of 15 variables, some are subsets or combinations of materials. When the subsets and combinations are eliminated, 10 variables emerge as characteristic of ARL libary size. These are: volumes held, volumes added (gross), microform units held, current serials received, expenditures for library materials, expenditures for binding, total salary and wage expenditures, other operating expenditures, number of professional staff, and number of nonprofessional staff.

These 10 categories delineate an underlying dimension, or factor, of library size. By means of principal component analysis, a technique that is a variant of factor analysis, it is possible to calculate the correlations of each of the variables with this hypothetical factor of library size. From this analysis a weight for each variable can be determined based on how closely that variable is correlated with the overall dimension of library size defined by all 10 categories. A high correlation indicates that much of the variation in ARL library size is accounted for by the variable in question, implying a characteristic in which ARL libraries are relatively alike. The component score coefficients, or weights, for

the 1979-80 ARL academic library data are as follows:

Volumes held	.12108
Volumes added (gross)	.11940
Microforms held	.07509
Current serials received	.12253
Expenditures for library materials	.12553
Expenditures for binding	.11266
Expenditures for salaries and wages	.12581
Other operating expenditures	.10592
Number of professional staff	.12347
Number of nonprofessional staff	.11297

From these weights an individual library can compute an index score that will indicate its relative position among ARL libraries with respect to the overall factor of library size. The data for each of the 10 variables are converted to standard normal form and multiplied by the appropriate weight. The resulting scores are expressed in terms of the number of standard deviations above or below the mean index score for ARL academic libraries. Thus, the formula* for calculating a library's 1979-80 index score is as follows:

.12108 (log of volumes held - 6.2916)/.2172
+.11940 (log of volumes added gross - 4.8412)/.2025
+.07509 (log of microforms - 6.0950)/.1763
+.12253 (log of current serials - 4.3432)/.2341
+.12553 (log of expenditures for materials - 6.2333)/.1636
+.11266 (log of expenditures for binding - 5.0480)/.2475
+.12581 (log of total salaries - 6.4675)/.2103
+.10592 (log of operating expenditures - 5.6773)/.2635
+.12347 (log of professional staff - 1.8281)/.1968
+.11297 (log of nonprofessional staff - 2.1512)/.2046

The index scores for the 99 academic libraries that were members of ARL during 1979-80 are shown on the following page. It is important to emphasize that these scores are only a summary description of library size, distributing ARL libraries along a normal curve, based on 10 quantitative measures that are positively correlated with one another in ARL libraries. The scores are in no way a qualitative assessment of the collections, services, or operations of these libraries.

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*For calculation on a hand calculator, the formula can be mathematically simplified to: (.55746 x log of volumes held) + (.58963 x log of volumes added gross) + (.42592 x log of microforms) + (.52341 x log of current serials) + (.76730 x log of expenditures for materials) + (.45519 x log of expenditures for binding) + (.59824 x log of total salries) + (.40197 x log of operating expenditures) + (.62739 x log of professional staff) + (.55215 x log of nonprofessional staff) - 26.79765.

APPENDIX E

FACULTY RESEARCH SUPPORT

The names of National Science Foundation (NSF) research grant awardees were obtained from a file maintained by the NSF Division of Information Systems. The file provided to the committee covered all research grant awards made in FY1978, FY1979, and FY1980 and included the names of the principal investigator and co-principal investigators for each award. Also available from this file was information concerning the field of science/engineering of the research grant and the institution with which the investigator was affiliated. This information was used in identifying which research grant recipients were on the program faculty lists provided by institutional coordinators.

The names of National Institutes of Health (NIH) and Alcohol, Drug Abuse, and Mental Health Administration (ADAMHA) research grant recipients (principal investigators only) were obtained from the NIH Information for Management Planning, Analysis, and Coordination System. This system contains a detailed record of all applications and awards in the various training and research support programs of these agencies. For the purposes of this study, information analogous to that available from the NSF file was extended for FY1978-80 research grant awardees and their records were matched with the program faculty lists. Measure 13 constitutes the fraction of program faculty members who had received one or more research grant awards from NSF (including both principal investigators and co-principal investigators), NIH, or ADAMHA during the FY1978-80 period.

R&D EXPENDITURES

Total university expenditures for R&D activities are available from the NSF Survey of Scientific and Engineering Expenditures at Universities and Colleges. A copy of the survey form appears on the following pages.

NSF FORM 411 (Dec. 1979)

FORM APPROVED
OMB No. 99-R0279

NATIONAL SCIENCE FOUNDATION
Washington, D.C. 20550

SURVEY OF SCIENTIFIC AND ENGINEERING EXPENDITURES AT UNIVERSITIES AND COLLEGES, FY 1979

(Current and Capital Expenditures for Research, Development, and Instruction in the Sciences and Engineering)

Organizations are requested to complete and return this form to:

NATIONAL SCIENCE FOUNDATION
1800 G Street, N.W.
Washington, D.C. 20550
Attn: UNISG

This form should be returned by February 1, 1980. Your cooperation in returning the survey questionnaire promptly is very important.

Financial data are requested for your institution's 1979 fiscal year.

This information is solicited under the authority of the National Science Foundation Act of 1950, as amended. All information you provide will be used for statistical purposes only. Your response is entirely voluntary and your failure to provide some or all of the information will in no way adversely affect your institution.

All financial data requested on this form should be reported in thousands of dollars; for example, an expenditure of $25,342 should be rounded to the nearest thousand dollars and reported as $25.

Where exact data are not available, estimates are acceptable. Your estimates will be better than ours.

Please correct if name or address has changed

(Includes aggregate data from 567 universities and colleges but excludes 19 university-administered FFRDC's)

Include data for branches and all organizational units of your institution, such as medical schools and agricultural experiment stations. Also include hospitals or clinics owned, operated, or controlled by universities, and integrated operationally with the clinical programs of your medical schools. Exclude data for federally funded research and development centers (FFRDC's). A separate questionnaire is included in this package if your institution administers an FFRDC. **If you have any questions please contact Jim Hoehn (202-634-4674).**

Please enter the beginning and ending dates of your institution's fiscal year for which you are reporting on this form:

______________________ through ______________________

Please note in space below:

(1) Any suggestions to improve the design of the survey questionnaire, (2) any suggestions to improve the instructions, or (3) any comments on significant change in R&D in your institution.

(Attach additional sheets, if necessary.)

PLEASE TYPE OR PRINT NAME OF PERSON SUBMITTING THIS FORM	TITLE	AREA CODE	EXCH	NO.	EXT
NAME OF PERSON WHO PREPARED THIS SUBMISSION (If different from above)	TITLE	AREA CODE	EXCH	NO.	EXT
Please check and correct if necessary the name and address of your institution shown on the mailing label.		DATE			

ITEM 1. CURRENT EXPENDITURES FOR SEPARATELY BUDGETED RESEARCH AND DEVELOPMENT (R&D) IN THE SCIENCES AND ENGINEERING, BY SOURCE OF FUNDS AND BASIC RESEARCH, FY 1979 (Include indirect costs)

ITEMS 1. & 2. INSTRUCTIONS

Separately budgeted research and development (R&D) includes all funds expended for activities specifically organized to produce research outcomes and commissioned by an agency either external to the institution or separately budgeted by an organizational unit within the institution. **Include** equipment purchased under research project awards as part of "current funds." Research funds subcontracted to outside organizations should also be included. **Exclude** training grants, public service grants, demonstration projects, etc.

Under a. **Federal Government.** Report grants and contracts for R&D by all agencies of the Federal Government including indirect costs from these sources.

Under b. **State and local governments.** Include funds for R&D from State, county, municipal, or other local governments and their agencies. Include here State funds which support R&D at agricultural experiment stations.

Under c. **Industry.** Include all grants and contracts for R&D from profitmaking organizations, whether engaged in production, distribution, research, service, or other activities. Do not include grants and contracts from nonprofit foundations financed by industry, which should be reported under **All other sources.**

Under d. **Institutional funds.** Report funds which your institution spent for R&D activities including indirect costs from the following sources: (1) General-purpose State or local government appropriations; (2) general-purpose grants from industry, foundations, or other outside sources; (3) tuition and fees; (4) endowment income. In addition, estimate your institution's contribution to unreimbursed indirect costs incurred in association with R&D projects financed by outside organizations, and mandatory cost sharing on Federal and other grants. To estimate unreimbursed indirect costs, many institutions use a university-wide negotiated indirect cost rate multiplied by the base (e.g., direct salaries and wages, etc.) minus actual indirect cost recoveries. If your institution now separately budgets what was previously classified as departmental research, these data should be included in line d.

Under e. **All other sources.** Include foundations and voluntary health agencies grants for R&D, as well as all other sources not elsewhere classified. Funds from foundations which are affiliated with or grant solely to your institution should be included under d. Institutional funds. Funds for R&D received from a health agency that is a unit of a State or local government should be reported under State and local governments. Also include gifts from individuals that are restricted by the donor to research.

Please exclude from your response any R&D expenditures in the fields of education, law, humanities, music, the arts, physical education, library science, and all other nonscience fields.

Source of funds		(1) Total R&D expenditures	(2) Basic research
		(Dollars in thousands)	(Percent of column 1)
a. Federal Government	1110	$ 3,431,538	73.4 %
*b. State and local governments	1125	467,311	**Basic research** is directed toward an increase of knowledge; it is research where the primary aim of the **investigator** is a fuller knowledge or understanding of the subject under study rather than a practical application thereof.
c. Industry	1150	193,794	
d. Institutional funds	1160	716,241	
(1) Separately budgeted	1161	357,926	
(2) Underrecovery of indirect costs and cost sharing	1162	358,315	
*e. All other sources	1175	373,845	
f. TOTAL (sum of a through e)	1100	$ 5,182,729	68.5 %

*Combined data cell (See instructions for b and e).

CONFIDENTIALITY

Information received from individual institutions in lines 1161 and 1162, or estimates for basic research expenditures, will **not** be published or released; only aggregate totals will appear in publications.

Total R&D expenditures reported in line 1100 column (1) and line 1400 column (1) should be the same.
Federally financed R&D expenditures reported in line 1100 column (1) and line 1400 column (2) should be the same.

ITEM 2. TOTAL AND FEDERALLY FINANCED EXPENDITURES FOR SEPARATELY BUDGETED RESEARCH AND DEVELOPMENT, BY FIELD OF SCIENCE, FY 1979 (Include indirect costs and equipment).

Field of science	Illustrative disciplines		(Dollars in thousands)	
			(1) Total	(2) Federal
a. ENGINEERING (TOTAL)	Aeronautical, agricultural, chemical, civil, electrical, industrial, mechanical, metallurgical, mining, nuclear, petroleum, bio- and biomedical, energy, textile, architecture	1410	$ 715,454	$ 474,866
b. PHYSICAL SCIENCES (TOTAL)		1420	559,566	448,992
(1) Astronomy	Astrophysics, optical and radio, x-ray, gamma-ray, neutrino	1421	39,026	26,862
(2) Chemistry	Inorganic, organo-metallic, organic, physical, analytical, pharmaceutical, polymer science (exclude biochemistry)	1422	204,062	154,031
(3) Physics	Acoustics, atomic and molecular, condensed matter, elementary particles, nuclear structure, optics, plasma	1423	275,680	236,872
(4) Other	Used for multidisciplinary projects within physical sciences and for disciplines not requested separately	1424	40,798	31,227
c. ENVIRONMENTAL SCIENCES (TOTAL)	ATMOSPHERIC SCIENCES: Aeronomy, solar weather modification, meteorology, extra-terrestrial atmospheres GEOLOGICAL SCIENCES: Engineering geophysics, geology, geodesy, geomagnetism, hydrology, geochemistry, paleomagnetism, paleontology, physical geography, cartography, seismology, soil sciences OCEANOGRAPHY: Chemical, geological, physical, marine geophysics, marine biology, biological oceanography	1430	429,129	307,493
d. MATHEMATICAL AND COMPUTER SCIENCES (TOTAL)		1440	145,087	94,534
(1) Mathematics	Algebra, analysis, applied mathematics, foundations and logic, geometry, numerical analysis, statistics, topology	1441	65,637	49,043
(2) Computer sciences	Design, development, and application of computer capabilities to data storage and manipulation, information science	1442	79,450	45,491
e. LIFE SCIENCES (TOTAL)		1450	2,814,824	1,810,729
(1) Biological sciences	Anatomy, biochemistry, biophysics, biogeography, ecology, embryology, entomology, genetics, immunology, microbiology, nutrition, parasitology, pathology, pharmacology, physical anthropology, physiology, botany, zoology	1451	949,993	690,805
(2) Agricultural	Agricultural chemistry, agronomy, animal science, conservation, dairy science, plant science, range science, wildlife	1452	565,697	168,849
(3) Medical	Anesthesiology, cardiology, endocrinology, gastroenterology, hematology, neurology, obstetrics, opthalmology, preventive medicine and community health, psychiatry, radiology, surgery, veterinary medicine, dentistry, pharmacy	1453	1,214,442	890,612
(4) Other	Used for multidisciplinary projects within life sciences	1454	84,692	60,463
f. PSYCHOLOGY (TOTAL)	Animal behavior, clinical, educational, experimental, human development and personality, social	1460	99,732	72,256
g. SOCIAL SCIENCES (TOTAL)		1470	290,057	153,674
(1) Economics	Econometrics, international, industrial, labor, agricultural, public finance and fiscal policy	1471	85,415	40,641
(2) Political science	Regional studies, comparative government, international relations, legal systems, political theory, public administration	1472	39,029	18,452
(3) Sociology	Comparative and historical, complex organizations, culture and social structure, demography, group interactions, social problems and welfare, theory	1473	72,669	46,739
(4) Other	History of science, cultural anthropology, linguistics, socio-economic geography	1474	92,944	47,842
h. OTHER SCIENCES, n.e.c. (TOTAL)*	To be used when the multidisciplinary and interdisciplinary aspects make the classification under one primary field impossible	1480	128,880	68,994
i. TOTAL (SUM of a through h) Check to insure that column totals are identical with data reported in item 1.		1400	5,182,729	3,431,538

***PLEASE EXCLUDE FROM YOUR RESPONSE ANY R&D EXPENDITURES IN THE FIELDS OF EDUCATION, LAW, HUMANITIES, MUSIC, THE ARTS, PHYSICAL EDUCATION, LIBRARY SCIENCE, AND ALL OTHER NONSCIENCE FIELDS.**

ITEM 3. CAPITAL EXPENDITURES FOR SCIENTIFIC AND ENGINEERING FACILITIES AND EQUIPMENT FOR RESEARCH, DEVELOPMENT, AND INSTRUCTION, BY FIELD OF SCIENCE AND SOURCE OF FUNDS, FY 1979

ITEM 3. INSTRUCTIONS

Report funds for facilities which were in process or completed during FY 1979. Expenditures for administration buildings, steam plants, residence halls, and other such facilities should be excluded unless utilized principally for research, development, or instruction in engineering or in the sciences. Land costs should be **excluded**. Exclude small equipment items in your current fund account costing approximately **$300** or less per unit or as recommended by the Joint Accounting Group (JAG) or as determined by your institutional policy; these are to be reported under items 1 and 2.

Facilities and equipment expenditures **include** the following. (a) Fixed equipment such as built-in equipment and furnishings; (b) movable scientific equipment such as oscilloscopes and pulse-height analyzers; (c) movable furnishings such as desk, (d) architect's fees, site work, extension of utilities, and the building costs of service functions such as integral cafeterias and bookstores of a facility; (e) facilities constructed to house separate components such as medical schools and teaching hospitals; and (f) special separate facilities used to house scientific apparatus such as accelerators, oceanographic vessels, and computers.

Field of science		(Dollars in thousands)		
		Total (1)	Federal (2)	All other sources (3)
a. Engineering	1710	$ 95,399	$ 22,060	$ 73,339
b. Physical sciences	1720	64,551	32,439	32,112
c. Environmental sciences	1730	25,293	8,970	16,323
d. Mathematical and computer sciences	1740	27,465	3,049	24,416
e. Life sciences	1750	456,477	92,567	363,910
f. Psychology	1760	7,803	1,767	6,036
g. Social sciences	1770	20,932	2,069	18,863
h. Other sciences, n.e.c.	1780	31,984	5,054	26,930
i. Total (sum of a through h)	1700	$ 729,904	$ 167,975	$ 561,929

APPENDIX F

DATA ON PUBLICATION RECORDS

Data for these measures were provided by a subcontractor, Computer Horizons, Inc. A detailed description of the derivation of these measures and examples of their use is given in:

> Francis Narin, Evaluative Bibliometrics: The Use of Publications and Citations Analysis in the Evaluation of Scientific Activity, Report to the National Science Foundation, March 1976.

The following pages have been excerpted from Chapters VI and VII of this report and describe operational considerations in compiling the publication records included here (measure 15) and the methodology used in determining the "influence" of published articles (measure 16).

VI. OPERATIONAL CONSIDERATIONS

A. Basics of Publication and Citation Analysis

The first section of this chapter discusses the major stages of publication and citation analysis techniques in evaluative bibliometrics. Later sections of the chapter consider publication and citation count parameters in further detail, including discussions of data bases, of field-dependent characteristics of the literature, and of some cautions and hazards in performing citation analyses for individual scientists.

The basic stages which must be kept in mind when doing a publication or citation analysis are briefly summarized in Figure 6-1.

1. Type of Publication

For a publication analysis the fundamental decision is which type of publication to count. A basic count will include all regular scientific articles. However, notes are often counted since some engineering and other journals often contain notes with significant technical content. Reviews may be included. Letters-to-the-editor must also be considered as a possible category for inclusion, since some important journals are sometimes classified as letter journals. For example, publications in Physical Review Letters were classified as letters by the Science Citation Index prior to 1970, although they are now classified as articles.

For most counts in the central core of the scientific literature, articles, notes and reviews are used as a measure of scientific output. When dealing with engineering fields, where many papers are presented at meetings accompanied by reprints and published proceedings, meeting presentations must also be considered. In some applied fields, i.e., agriculture, aerospace and nuclear engineering, where government support has been particularly comprehensive, the report literature may also be important. Unfortunately, reports generally contain few references, and citations to them are limited so they are not amenable to the normal citation analyses.

Books, of course, are a major type of publication, especially in the social sciences where they are often used instead of a series of journal articles. In bibliometrics a weighting of n articles equal to one book is frequently used; no uniformly acceptable value of n is available. A few of the papers discussed in Chapter V contain such measures.

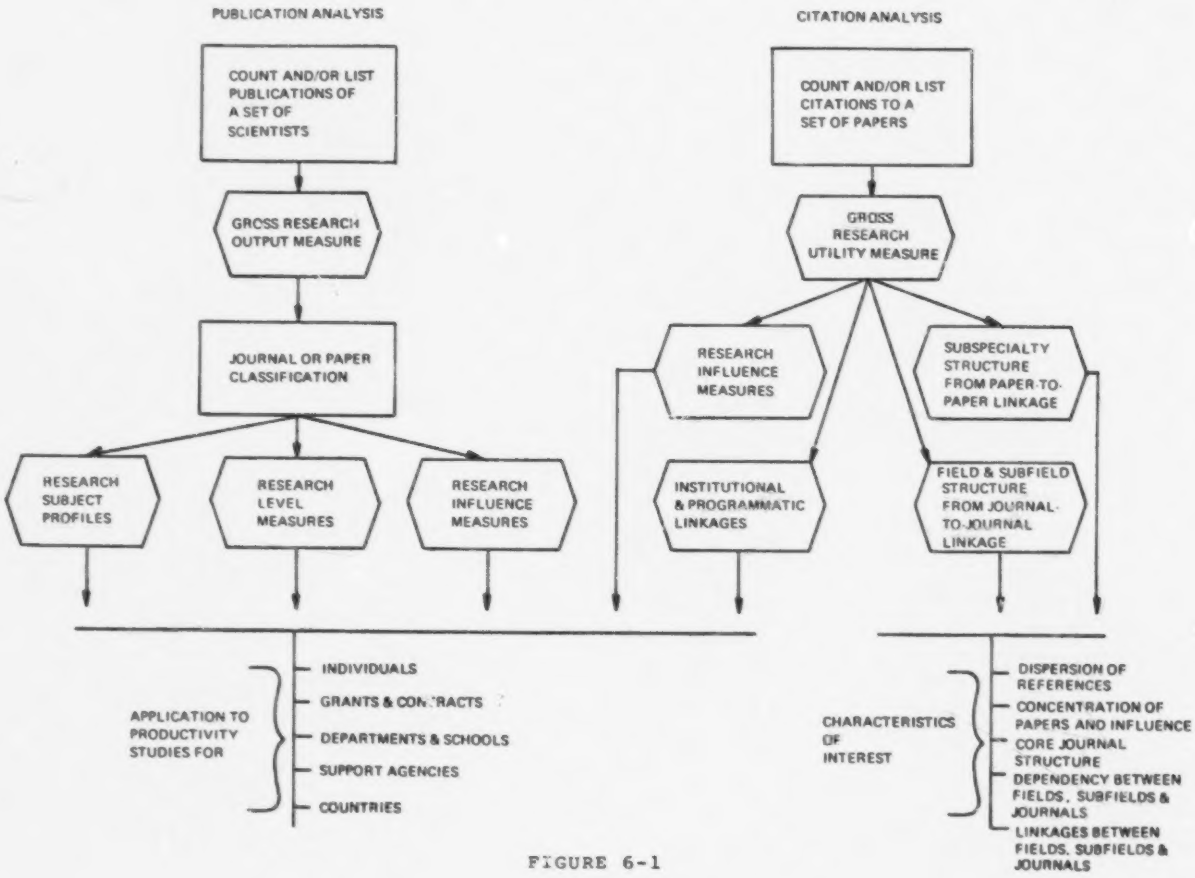
PUBLICATION ANALYSIS
COUNT AND/OR LIST PUBLICATIONS OF A SET OF SCIENTISTS
GROSS RESEARCH OUTPUT MEASURE
JOURNAL OR PAPER CLASSIFICATION
RESEARCH SUBJECT PROFILES
RESEARCH LEVEL MEASURES
RESEARCH INFLUENCE MEASURES
APPLICATION TO PRODUCTIVITY STUDIES FOR
INDIVIDUALS
GRANTS & CONTRACTS
DEPARTMENTS & SCHOOLS
SUPPORT AGENCIES
COUNTRIES
CITATION ANALYSIS
COUNT AND/OR LIST CITATIONS TO A SET OF PAPERS
GROSS RESEARCH UTILITY MEASURE
RESEARCH INFLUENCE MEASURES
SUBSPECIALTY STRUCTURE FROM PAPER-TO-PAPER LINKAGE
INSTITUTIONAL & PROGRAMMATIC LINKAGES
FIELD & SUBFIELD STRUCTURE FROM JOURNAL-TO-JOURNAL LINKAGE
CHARACTERISTICS OF INTEREST
DISPERSION OF REFERENCES
CONCENTRATION OF PAPERS AND INFLUENCE
CORE JOURNAL STRUCTURE
DEPENDENCY BETWEEN FIELDS, SUBFIELDS & JOURNALS
LINKAGES BETWEEN FIELDS, SUBFIELDS & JOURNALS

FIGURE 6-1

STAGES OF PUBLICATION AND CITATION ANALYSIS

2. Time Spans

A second important decision in making a publication count is to select the time span of interest. In the analysis of the publications of an institution a fixed time span, usually one year or more, is most appropriate. In comparing publication histories of groups of scientists, their professional ages (normally defined as years since attaining the PhD degree) must be comparable so that the build-up of publications at the beginning of a career or the decline at the end will not complicate the results. A typical scientist's first publication appears soon after his dissertation; if he continued working as a scientist, his publications may continue for thirty or more years.

The accurate control of the time span of a count is not as trivial as it might seem. Normally, the publication count is made from secondary sources (abstracting or indexing services) rather than from scanning the publications individually. Since most abstracting and indexing sources have been expanding their coverage over time, any publication count covering more than a few years must give careful consideration to changes in coverage. Furthermore, the timeliness of the secondary sources varies widely, with sources dependent on outside abstractors lagging months or even years behind. Since these abstracting lags may depend upon language, field and country of origin, they are a particular problem in international publication counts.

The Science Citation Index is one of the most current secondary sources, with some 80% to 90% of a given year's publications in the SCI for that year.

Of course, no abstracting or indexing service can be perfect, since some journals are actually published months after their listed publication dates. Nevertheless, variations in timeliness are large from one service to another.

3. Comprehensiveness of Source Coverage

An important consideration in making a publication count is the comprehensiveness of the source coverage. Most abstracting and indexing sources cover some journals completely, cover other journals selectively, and omit some journals in their field of interest. The Science Citation Index is an exception in that it indexes each and every important entry from any journal it covers. This is one of the major advantages in using the SCI as a data base. Chemical Abstracts and Biological Abstracts have a group of journals which they abstract completely, coupled with a much larger set of journals from which they abstract selectively, based upon the appropriateness of the article to the subject coverage. In some cases the abstractor or indexer may make a quality judgment, based on his estimate of the importance or the quality of the article or upon his

knowledge of whether similar information has appeared elsewhere; Excerpta Medica is a comprehensive abstracting service for which articles are included only if they meet the indexers' quality criteria.

Some data on the extent of coverage of the major secondary sources is presented in Section D of this chapter.

4. Multiple Authorships and Affiliations

Attributing credits for multiple authorships and affiliations is a significant problem in publication and citation analysis. In some scientific papers the authors are listed alphabetically; in others the first author is the primary author; still others use different conventions. These conventions have been been discussed by Crane[1] and by other social scientists.[2] There does not seem to be any reasonable way to deal with the attribution problem, except to attribute a fraction of a publication to each of the authors. For example, an article which has three authors would have one-third of an article attributed to each author. The amount of multiple authorship unfortunately differs from country to country and from field to field. Several studies have investigated the problem, but no comprehensive data exists.[3]

Multiple authorship takes on particular importance when counting an individual's publications since membership on a large research team may lead to a single scientist being a coauthor of ten or more publications per year. This number of publications is far in excess of the normal publication rate of one to two articles per year per scientist.

Multiple authorship problems arise less often in institutional publication counts since there are seldom more than one or two institutions involved in one publication.

A particularly vexing aspect of multiple authorship is the first author citation problem: almost all citations are to the first author in a multi-authored publication. As a result, a researcher who is second author of five papers may receive no

citations under his own name, even though the papers he co-authored may be highly cited. Because of this, a citation count for a person must account for the citations which appear under the names of the first authors of publications for which the author of interest was a secondary author. This can lead to a substantial amount of tedious additional work, since a list of first authors must be generated for all of the subjects' multi-authored papers. Citations to each of these first authors must then be found, the citations of interest noted, and these citations fractionally attributed to the original author. Since multiple years of the Citation Index are often involved, the amount of clerical work searching from volume to volume and from author to author, and citation to citation can be quite large.

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[1] Diana Crane, "Social Structure in a Group of Scientists: A Test of the 'Invisible College' Hypothesis," American Sociological Review 34 (June 1969):335-352.

[2] James E. McCauly, "Multiple Authorship," Science 141 (August 1963):579.

Beverly L. Clark, "Multiple Authorship Trends in Scientific Papers," Science 143 (February 1964):822-824.

[3] Harriet Zuckerman, "Nobel Laureates in Science: Patterns of Productivity, Collaboration, and Authorship," American Sociolgoical Review 32 (June 1967):391-403.

A note of caution about the handling of multiple authorship in the Corporate Index of the Science Citation Index: SCI lists a publication giving all the corporate affiliations, but always with the first author's name. Thus a publication by Jones and Smith where Jones is at Harvard and Smith is at Yale would be listed in the Corporate Index under Harvard with the name Jones and also under Yale with the name Jones. To find the organization with which the various authors are affiliated, the original article must be obtained.

Although the publisher of the Science Citation Index, the Institute for Scientific Information, tries to maintain a consistent policy in attributing institutional affiliations, when authors have multiple affiliations the number of possible variants is large. In the SCI data base on magnetic tape, sufficient information is included to assign a publication with authors from a number of different institutions in a reasonably fair way to those institutions; however, in the printed Corporate Index, one has to refer to the Source Index to find the actual number of authors, or to the paper itself to find the affiliations of each of the authors.

5. Completeness of Available Data

Another consideration in a publication analysis is the completeness of data available in the secondary source, since looking up hundreds or thousands of publications individually is tedious and expensive. One difficulty here is that most of the abstracting and indexing sources are designed for retrieval and not for analysis. As a result, some of the parameters which are of greatest analytical importance, such as the affiliation of the author and his source of financial support, are often omitted. Furthermore, some of the abstracting sources are cross-indexed in complex ways, so that a publication may only be partially described at any one point, and reference must be made to a companion volume to find even such essential data as the author's name. While intellectually trivial, these

searches can be exceedingly time consuming when analyzing large numbers of publications.

The specific data which are consistently available in the secondary sources are the basic bibliographic information: i.e., authors' name, journal or report title, volume, page, etc. This information is the basic data used for retrieval, and since the abstracting and indexing services are retrieval oriented, this bibliographic information is always included.

Data which are less consistently available in the secondary source are the authors' affiliation and the authors' rank or title. Both of these are of interest in analysis. For example, the ranking of universities based on publication in a given subject area is often of interest. This ranking can be tabulated only from a secondary source which gives the authors' university affiliation.

6. Support Acknowledgements

The source of the authors' financial support is seldom given in any secondary source, although it is now being added to the MEDLARS data base. Since this financial data can be used to define the fraction of a subject literature which is being supported by a particular corporate body such as a governmental agency, the data are of substantial evaluative interest.

The amount of acknowledgement of agency support in the scientific literature has changed over time. In a Computer Horizons study completed in 1973 the amount of agency support acknowledgement was tabulated in twenty major journals from five different fields.[4] Table 6-1 summarizes those support acknowledgements for 1969 and 1972.

In 1969, only 67% of the articles in 20 major journals acknowledged financial support. By 1972, the percentage of articles acknowledging financial support had risen to approximately 85%. The table shows that the sources of support differ from one field to another and also shows that the fields of interest to these sources differ as well. For example, the National Science Foundation is the major source of acknowledged support in mathematics, while the National Institutes of Health clearly dominate the support of biology. Chemistry is the field with the largest amount of non-government (private sector) support in the U.S.

Note also that the 20 journals used were major journals in their fields; as less prestigious journals are examined, the amount of support acknowledgement generally decreases.

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[4] Computer Horizons, Inc., Evaluation of Research in the Physical Sciences Based on Publications and Citations, Washington, D.C., National Science Foundation, Contract No. NSF-C627, November, 1973.

TABLE 6-1

AGENCY SUPPORT ACKNOWLEDGEMENTS IN 20 LEADING JOURNALS FROM 5 MAJOR FIELDS - 1969 and 1972

Agency Acknowledged	Mathematics 1969	Mathematics 1972	Physics 1969	Physics 1972	Chemistry 1969	Chemistry 1972	Biochemistry 1969	Biochemistry 1972	Biology 1969	Biology 1972	All Fields 1969	All Fields 1972
NSF	18%	37%	14%	19%	18%	21%	8%	8%	8%	8%	13%	16%
NIH	2	1	1	1	11	10	37	39	23	32	13	16
AEC	1	1	21	15	10	8	3	2	3	2	11	8
DOD	15	7	19	15	10	10	1	1	2	3	10	9
NASA	1	1	7	9	2	2	1	1	1	2	3	4
Other U.S. Government	1	2	1	2	2	2	1	1	1	3	1	2
Other U.S.	3	10	3	14	8	21	10	10	9	13	7	14
Foreign	5	4	5	15	7	8	16	25	10	24	8	16
Unacknowledged	55	37	31	11	32	18	25	13	42	14	33	15

In an attempt to account for the 15% of unacknowledged papers, a questionnaire was sent to all U.S. authors in the 1972 sample who did not acknowledge agency support. Almost 70% of the authors who had not listed sources of support responded to the questionnaire. Of the authors who responded, over two-thirds were supported by their institutions as part of their regular duties; approximately 20% of the respondents cited specific governmental agencies as sources of support, even though they had not acknowledged these in the article itself. Twelve percent of the respondents listed no agency or institutional support; research done as fulfillment of graduate studies was included in this category.

Overall, the 1972 tabulation and survey showed that 88% of the research reported in these prestigious journals was externally supported, and that 97% of the externally supported work was acknowledged as such.

7. Subject Classification

Having constructed a basic list of publications, the next step in analysis is normally to subject classify the publications. Either the journals or the papers themselves may be classified. When a large number of papers is to be analyzed, classification of the papers by the field of the journal can be very convenient. Such a classification implies, of course, a degree of homogeneity of publication which is normally adequate when analyzing hundreds of papers. Such a classification may not be sufficient for the analysis of the scientific publications of one or a few individuals.

Subject classification schemes differ from one abstracting and indexing service to another. Therefore, a comparison of a collection of papers based on the classification schemes of more than one abstracting and indexing service is almost hopeless. A classification of papers at the journal level has been used in the influence methodology discussed in Chapters VII through X.

8. Citation Counts

Citation counts are a tool in evaluative bibliometrics second in importance only to the counting and classification of publications. Citation counts may be used directly as a measure of the utilization or influence of a single publication or of all the publications of an individual, a grant, contract, department, university, funding agency or country. Citation counts may be used to link individuals, institutions, and programs, since they show how one publication relates to another publication.

In addition to these evaluative uses, citations also have important bibliometric uses, since the references from one paper to another define the structure of the scientific literature. Chapter III discusses how this type of analysis may be carried out at a detailed, micro-level to define closely related papers through bibliographic coupling and co-citation. That chapter also describes how citation analysis may be used at a macro-level to link fields and subfields through journal-to-journal mapping. The bibliometric characteristics of the literature also provide a numeric base against which evaluative parameters may be normalized.

Some of the characteristics of the literature which are revealed by citation analysis are noted on Figure 6-1. These characteristics include:

> The dispersion of references: a measure of scientific "hardness", since in fields that are structured and have a central core of accepted knowledge, literature references tend to be quite concentrated.
>
> The concentration of papers and influence: another measure of centrality in a field, dependent upon whether or not a field has a core journal structure.
>
> The hierarchic dependency relationships between field, subfield and journals, including the comparison of numbers of references from field A to field B, compared with number of references from field B to field A: this comparison provides a major justification for the pursuit of basic research as a foundation of knowledge utilized by more applied areas.
>
> The linkages between fields, subfields and journals: a measure of the flow of information, and of the importance of one sector of the scientific mosaic to another.

VII. THE INFLUENCE METHODOLOGY

A. Introduction

In this chapter an influence methodology will be described which allows advanced publication and citation techniques to be applied to institutional aggregates of publications, such as those of departments, schools, programs, support agencies and countries, without performing an individual citation count. In essence, the influence procedure ascribes a weighted average set of properties to a collection of papers, such as the papers in a journal, rather than determining the citation rate for the papers on an individual basis.

The influence methodology is completely general, and can be applied to journals, subfields, fields, institutions or countries.

There are three separate aspects of the influence methodology which are particularly pertinent to journals. These are

1. A subject classification for each journal
2. A research type (level) classification for the biomedical journals, and
3. Citation influence measures for each journal.

It is the third of these, the citation influence measures, which add a quality or utilization aspect to the analysis. The influence methodology assumes that, although citations to papers vary within a given journal, aggregates of publications can be characterized by the influence measures of the journals in which they appear. Chapter IX discusses this assumption in some detail.

Older measures of influence all suffer from some defect which limits their use as evaluative measures.

The total number of publications of an individual, school or country is a measure of total activity only; no inferences concerning importance may be drawn.

The total number of citations to a set of publications, while incorporating a measure of peer group recognition, depends on the size of the set involved and has no meaning on an absolute scale.

The journal "impact factor" introduced by Garfield is a size-independent measure, since it is defined as the ratio of the number of citations the journal receives to the number of publications in a specified earlier time period.[1] This

measure, like the total number of citations, has no meaning on an absolute scale. In addition the impact factor suffers from three more significant limitations. Although the size of the journal, as reflected in the number of publications, is corrected for, the average length of individual papers appearing in the journal is not. Thus, journals which publish longer papers, namely review journals, tend to have higher impact factors. In fact the nine highest impact factors obtained by Garfield were for review journals. This measure can therefore not be used to establish a "pecking order" for journal prestige.

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[1] Eugene Garfield, "Citation Analysis As a Tool in Journal Evaluation," Science 178 (November 3, 1972):471.

The second limitation is that the citations are unweighted, all citations being counted with equal weight, regardless of the citing journal. It seems more reasonable to give higher weight to a citation from a prestigious journal than to a citation from a peripheral one. The idea of counting a reference from a more prestigious journal more heavily has also been suggested by Kochen.[2]

A third limitation is that there is no normalization for the different referencing characteristics of different segments of the literature: a citation received by a biochemistry journal, in a field noted for its large numbers of references and short citation times, may be quite different in value from a citation in astronomy, where the overall citation density is much lower and the citation time lag much longer.

In this section three related influence measures are developed, each of which measures one aspect of a journal's influence,with explicit recognition of the size factor. These measures are:

(1) The influence weight of the journal: a size-independent measure of the weighted number of citations a journal receives from other journals, normalized by the number of references the journal gives to other journals.

(2) The influence per publication for the journals: the weighted number of citations each article, note or review in a journal receives from other journals.

(3) The total influence of the journal: the influence per publication times the total number of publications.

---

[2] M.Kochen, Principles of Information Retrieval, (New York: John Wiley & Sons, Inc. 1974), 83.

B. Development of the Weighting Scheme

1. The Citation Matrix

A citation matrix may be used to describe the interactions among members of a set of publishing entities. These entities may, for example, be journals, institutions, individuals, fields of research, geographical subdivisions or levels of research methodology. The formalism to be developed is completely general in that it may be applied to any such set. To emphasize this generality, a member of a set will be referred to as a unit rather than as a specific type of unit such as a journal.

The citation matrix is the fundamental entity which contains the information describing the flow of influence among units.

The matrix has the form

$$C = \begin{pmatrix} c_{11} & c_{12} & \ldots & c_{1n} \\ c_{21} & c_{22} & \ldots & c_{2n} \\ \vdots & \vdots & & \vdots \\ c_{n1} & c_{n2} & \ldots & c_{nn} \end{pmatrix}$$

A distinction is made between the use of the terms "reference" and "citation" depending on whether the issuing or receiving unit is being discussed. Thus, a term C_{ij} in the citation matrix indicates both the number of references unit i gives to unit j and the number of citations unit j receives from unit i.

The time frame of a citation matrix must be clearly understood in order that a measure derived from it be given its proper interpretation. Suppose that the citation data are based on references issued in 1973. The citations received may be to papers in any year up through 1973. In general, the papers issuing the references will not be the same as those receiving the citations. Thus, any conclusions drawn from such a matrix assume an on-going, relatively constant nature for each of the units. For instance, if the units of study are journals, it is assumed that they have not changed in size relative to each other and represent a constant subject area. Journals in rapidly changing fields and new journals would therefore have to be treated with caution.

A citation matrix for a specific time lag may also be formulated. This would link publications in one time period with publications in some specified earlier time period.

2. Influence Weights

For each unit in the set a measure of the influence of that unit will be extracted from the citation matrix. Because total influence is clearly a size-dependent quantity, it is essential to distinguish between a size-independent measure of influence, to be called the influence weight, and the size-dependent total influence.

To make the idea of a size-independent measure more precise, the following property of such a measure may be specified: if a journal were randomly subdivided into smaller entities, each entity would have the same measure as the parent journal.

The citation matrix may be thought of as an "input-output" matrix with the medium of exchange being the citation. Each unit gives out references and receives citations; it is above average if it has a "positive citation balance", i.e., receives more than it gives out. This reasoning provides a first order approximation to the weight of each unit, which is

$$W_i^{(1)} = \frac{\text{total number of citations to the ith unit from other units}}{\text{total number of references from the ith unit to other units}}.$$

This is the starting point for the iterative procedure for the calculation of the influence weights to be described below.

The denominator of this expression is the row sum

$$S_i = \sum_{j=1}^{n} C_{ij}$$

corresponding to the ith unit of the citation matrix; it may be thought of as the "target size" which this unit presents to the referencing world.

The influence weight, W_i, of the ith unit is defined as

$$W_i = \sum_{k=1}^{n} \frac{W_k \; C_{ki}}{S_i}$$

In the sum, the number of cites to the ith unit from the kth unit is weighted by the weight of kth (referencing) unit. The number of cites is also divided by the target size S_i of

the unit i being cited. The n equations, one for each unit, provide a self consistent "bootstrap" set of relations in which each unit plays a role in determining the weight of every other unit. The following summarizes the derivation of those weights.

The equations defining the weights,

$$W_i = \sum_{k=1}^{n} \frac{W_k \quad C_{ki}}{S_i}, \qquad i = 1,..,n \qquad (1)$$

are a special case of a more general system of equations which may be written in the form

$$\left\{ \sum_{k=1}^{n} W_k \quad \gamma_{ki} \right\} - \lambda W_i = 0, \qquad i = 1,..,n \quad . \qquad (2)$$

Here $\gamma_{ki} = \frac{C_{ki}}{S_i}$ and Equation 1 is shown to be

a special case of Equation 2 corresponding to $\lambda = 1$. As will be explained shortly the system of equations given in (1) will not, in general, possess a non-zero solution; only for certain values of λ called the eigenvalues of the system, will there be non-zero solutions.

With the choice of target size S_i, the value $\lambda = 1$ is in fact an eigenvalue so that Equation 1 itself does possess a solution.

Using the notation γ^T for the transpose of γ,

$\gamma^T_{ik} = \gamma_{ki}$; introducing the Kronecker delta symbol

defined by $\delta_{ik} = \begin{cases} 1 & i = k \\ 0 & i \neq k \end{cases}$

the equation can then be written

$$\sum_{k=1}^{n} \left(\gamma^{T}_{ik} - \lambda \delta_{ik}\right) w_k = 0 \; . \qquad (3)$$

This is a system of n homogeneous equations for the weights. In order that a solution for such a system exists, the determinant of the coefficients must vanish. This gives an nth order equation for the eigenvalues

$$\begin{vmatrix} \gamma_{11}-\lambda & \gamma_{21} \; . \; . \; . \; . & \gamma_{n1} \\ \gamma_{12} & \gamma_{22}-\lambda \; . \; . \; . & \gamma_{n2} \\ \vdots & \vdots & \vdots \\ \gamma_{1n} & \gamma_{2n} \; . \; . \; . \; . & \gamma_{nn}-\lambda \end{vmatrix} = 0 \qquad (4)$$

called the characteristic equation.

Only for values of λ which satisfy this equation, does a non-zero solution for the W's exist. Moreover, Equation 3 does not determine the values of the w_k themselves, but at best determines their ratios. Equivalently the eigenvalue equation may be thought of as a vector equation for the vector unknown $\underline{W} = \left\{w_1, \ldots, w_n\right\}$

$$\underline{\underline{\gamma}}^{T} \cdot \underline{W} = \lambda \underline{W} \qquad (5)$$

from which it is clear that only the direction of $\underline{W}$ is determined.

The normalization or scale factor is then fixed by the condition that the size-weighted average of the weights is 1, or

$$\frac{\sum_{1}^{n} s_k \; w_k}{\sum_{1}^{n} s_k} = 1 \qquad (6)$$

This normalization assures that the weight values have an absolute as well as a relative meaning, with the value 1 representing an average value.

Each root of the characteristic equation determines a solution vector or eigenvector of the equation, but the weight vector being sought is the eigenvector corresponding to the largest eigenvalue. This can be seen from the consideration of an alternative procedure for solving the system of equations, a procedure which also leads to the algorithm of choice.

Consider an iterative process starting with equal weights for all units. The values $W_i^{(0)} = 1$ can be thought of as zeroth order approximations to the weights. The first order weights are then

$$W_i^{(1)} = \frac{\sum_{k=1}^{n} C_{ki}}{S_i}$$

This ratio (total cites to a unit divided by the target size of the unit) is the simplest size-corrected citation measure and, in fact, corresponds to the impact measure used by Garfield. These values are then substituted into the right hand side of Equation 1 to obtain the next order of approximation. In general, the mth order approximation is

$$w_i^{(m)} = \sum_{k=1}^{n} \frac{w_k^{(m-1)} \quad C_{ki}}{S_i} = \sum_{k=1}^{n} w_k^{(m-1)} \times \gamma_{ki} = \sum_{j=1}^{n} \left(\gamma^m\right)_{ji}$$

The exact weights are therefore

$$w_i = w_i^{(\infty)} = \sum_{j=1}^{n} \left(\lim_{m \to \infty} \gamma^m\right)_{ji}$$

This provides the most convenient numerical procedure for finding the weights, the whole iteration procedure being reduced to successive squarings of the γ matrix.

This procedure is closely related to the standard method for finding the dominant eigenvalue of a matrix. Since $\lambda = 1$ is the largest eigenvalue, repeated squarings are all that is needed. If the largest eigenvalue had a value other than 1, the normalization condition, Equation 6, would have to be reimposed with each squaring. Convergence to three decimal places usually occurs with six squarings,corresponding to raising γ to the 64th power.

APPENDIX G

CONFERENCE ON THE ASSESSMENT OF QUALITY OF GRADUATE EDUCATION PROGRAMS

September 27-29, 1976
Woods Hole, Massachusetts

Participants

Robert A. ALBERTY	Dean of Science, Massachusetts Institute of Technology
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Hanna H. GRAY	Provost, Yale University
Norman HACKERMAN	President, Rice University
Philip HANDLER	President, National Academy of Sciences
David D. HENRY	President Emeritus, University of Illinois
Roger W. HEYNS	President, American Council on Education
Lyle V. JONES	Vice Chancellor and Dean, Graduate School, University of North Carolina at Chapel Hill
Charles V. KIDD	Executive Secretary, Association of American Universities
Winfred P. LEHMANN	Professor, Department of Linguistics, University of Texas at Austin
Charles T. LESTER	Vice-President of Arts and Sciences, Emory University

Gardner LINDZEY	Director, Center for Advanced Study in the Behavioral Sciences (Chairman)
Raymond P. MARIELLA	Dean of the Graduate School, Loyola University
Cora B. MARRETT	Center for Advanced Study in the Behavioral Sciences
Peter S. McKINNEY	Acting Dean, Graduate School of Arts and Sciences, Harvard University
Doris H. MERRITT	Dean, Research and Sponsored Programs, Indiana University/Purdue University
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J. Boyd PAGE	President, The Council of Graduate Schools in the United States
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Michael J. PELCZAR, Jr.	Vice-President for Graduate Studies and Research, University of Maryland, College Park
Frank PRESS	Chairman, Department of Earth and Planetary Sciences, Massachusetts Institute of Technology
John J. PRUIS	President, Ball State University
Lorene L. ROGERS	President, University of Texas at Austin
John SAWYER	President, The Andrew W. Mellon Foundation
Robert L. SPROULL	President, University of Rochester
Eliot STELLAR	Provost, University of Pennsylvania
Alfred S. SUSSMAN	Dean, Horace H. Rackham School of Graduate Studies, University of Michigan
Donald C. SWAIN	Academic Vice-President, University of California System
Mack E. THOMPSON	Executive Director, American Historical Association
Charles V. WILLIE	Professor of Education and Urban Studies, The Graduate School of Education, Harvard University
H. Edwin YOUNG	Chancellor, University of Wisconsin, Madison
Harriet A. ZUCKERMAN	Associate Professor, Department of Sociology, Columbia University

SUMMARY

September 27-29, 1976, Woods Hole, Massachusetts

Report of the Conference

A substantial majority of the Conference believes that the earlier assessments of graduate education have received wide and important use: by students and their advisors, by the institutions of higher education as aids to planning and the allocation of educational functions, as a check of unwarranted claims of excellence, and in social science research.

The recommendations which follow attempt to distill the main points of consensus within the conference. This report does not in any sense adequately represent the rich diversity of points of view revealed during the Conference nor the deep and real differences in belief among the participants.

Recommendations

1. A new assessment of graduate programs is needed, and we believe that the Conference Board is an appropriate sponsor. While we do not propose to specify the details of this assessment, we are prepared to suggest the following guidelines.

2. The assessment should include a modified replication of the Roose-Andersen study, with the addition of some fields and the subdivision of others.

3. It is important to provide additional indices relevant to program assessment such as some of those cited by Breneman, Drew, and Page. The Conference directs specific attention to the CGS/ETS Study currently nearing completion and urges that the results of that study be carefully examined and used to the fullest possible extent.

4. The initial assessment study should be one of surveying the quality of scholarship and research and the effectiveness of Ph.D. programs in the fields selected for inclusion.

    a. It is intended that the study be carried forward on a continuing basis to provide valuable longitudinal data. This should be implemented along the lines suggested by Moses, involving annual assessment of subsets of programs.

    b. Every eligible institution should be given the choice of whether to be included in the study.

    c. Each program is to be characterized by a set of scores, one for each selected index. The presentation of scores for all

reported indices should be accompanied by a discussion of their substantive meaning. In addition, appropriate measures of uncertainty should accompany all tables of results.

5. We propose a simultaneous study exploring ways of reviewing goals of graduate education other than research and scholarship. This would involve review of other doctoral programs and selected master's programs.

APPENDIX H

PLANNING COMMITTEE FOR THE STUDY OF THE QUALITY OF RESEARCH-DOCTORATE PROGRAMS

September 1978

Robert M. Bock
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University of Wisconsin
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Philip E. Converse
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Richard A. Goldsby
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Sterling McMurrin
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George Pake
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C. K. N. Patel
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Cornelius Pings
Dean of the Graduate School
California Institute of
Technology

Gordon Ray
President
The John Simon Guggenheim
Memorial Foundation

Harriet A. Zuckerman,
Co-Chairman
Department of Sociology
Columbia University

APPENDIX I

REGION AND STATE CODES
FOR THE UNITED STATES AND POSSESSIONS
(and U.S. Government)

REGION 1 - NEW ENGLAND

11	Maine
12	New Hampshire
13	Vermont
14	Massachusetts
15	Rhode Island
16	Connecticut

REGION 2 - MIDDLE ATLANTIC

21	New York
22	New Jersey
23	Pennsylvania

REGION 3 - EAST NORTH CENTRAL

31	Ohio
32	Indiana
33	Illinois
34	Michigan
35	Wisconsin

REGION 4 - WEST NORTH CENTRAL

41	Minnesota
42	Iowa
43	Missouri
44	North Dakota
45	South Dakota
46	Nebraska
47	Kansas

REGION 5 - SOUTH ATLANTIC

51	Delaware
52	Maryland
53	District of Columbia
54	Virginia
55	West Virginia
56	North Carolina
57	South Carolina
58	Georgia
59	Florida

REGION 6 - EAST SOUTH CENTRAL

61	Kentucky
62	Tennessee
63	Alabama
64	Mississippi

REGION 7 - WEST SOUTH CENTRAL

71	Arkansas
72	Louisiana
73	Oklahoma
74	Texas

REGION 8 - MOUNTAIN

81	Montana
82	Idaho
83	Wyoming
84	Colorado
85	New Mexico
86	Arizona
87	Utah
88	Nevada

REGION 9 - PACIFIC

90	Guam
91	Washington
92	Oregon
93	California
94	Alaska
95	Hawaii
96	Virgin Islands
97	Panama Canal Zone
98	Puerto Rico

R6000-14.4

An Assessment of Research-Doctorate Programs in the United States:

Biological Sciences

Committee on an Assessment of Quality-Related Characteristics
of Research-Doctorate Programs in the United States

Lyle V. Jones, Gardner Lindzey, and
Porter E. Coggeshall, *Editors*

Sponsored by

The Conference Board of Associated Research Councils

American Council of Learned Societies
American Council on Education
National Research Council
Social Science Research Council

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This report has been reviewed by a group other than the authors and editors according to procedures approved by each of the four member Councils of the Conference Board.

The Conference Board of Associated Research Councils was created to foster discussion of issues of mutual interest; to determine the extent to which a common viewpoint on such issues prevails within the academic community of the United States; to foster specific investigations when so desired; and, when the Conference Board finds joint, common, or other action desirable, to make recommendations to the appropriate Councils.

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The committee is most appreciative of the cooperation it received from individuals in the 228 universities participating in the assessment. In particular we thank the university presidents and chancellors who agreed to participate and offered the assistance of staff members at their institutions; the graduate deans, department chairmen, and many other university personnel who helped to compile information about the research-doctorate programs at their own institutions; and the nearly 5,000 faculty members who took the time to complete and return reputational survey forms. This assessment would not have been feasible without the participation of these individuals. Nor would it have been complete without the suggestions from many individuals within and outside the academic community who reviewed the study plans and committee reports.

The committee also acknowledges the contributions of Francis Narin and Paul R. McAllister, whose innovative work in the area of publication productivity in science and engineering fields has been a valuable resource. We thank H. Roberts Coward and his colleagues at the Institute for Scientific Information for their help in compiling publications data as well as William Batchelor and John James at NIH and David Staudt at NSF for their help in acquiring data on individual research grant awards.

Within the National Research Council many individuals have assisted in the planning and completion of this project. Robert A. Alberty, Harrison Shull, and W. K. Estes, former chairmen of the Commission on Human Resources, and William C. Kelly, Executive Director of the commission (now the Office of Scientific and Engineering Personnel), offered assistance and helpful counsel during all phases of the study. Lindsey R. Harmon and C. Alan Boneau contributed greatly to the planning of the assessment.

To Porter E. Coggeshall, Study Director, the committee expresses thanks for a job extremely well done. His ability to translate the committee's directions into compiled data and analyses must be given a large share of the credit for the completion of this project. He has been ably assisted by Prudence W. Brown, who supervised the data collection activities; Dorothy G. Cooper, who provided excellent secretarial support; George A. Boyce, whose programming expertise was invaluable; and Kathleen Drennan and Linda Dix, who helped in preparing final copy of the manuscript.

Committee on an Assessment of Quality-Related
Characteristics of Research-Doctorate Programs
in the United States

Preface

The genius of American higher education is often said to be in the close association of training and research--that is, in the nation's research-doctorate programs. Consequently, we are not surprised at the amount of worried talk about the quality of the research doctorate, for deterioration at that level will inevitably spread to wherever research skills are needed--and that indeed is a far-flung network of laboratories, institutes, firms, agencies, bureaus, and departments. What might surprise us, however, is the imbalance between the putative national importance of research-doctorate programs and the amount of sustained evaluative attention they themselves receive.

The present assessment, sponsored by the Conference Board of Associated Research Councils--comprised of the American Council of Learned Societies, the American Council on Education, the National Research Council (NRC), and the Social Science Research Council--seeks to correct the imbalance between worried talk and systematic study. In this effort the Conference Board continues a tradition pioneered by the American Council on Education, which in 1966 published *An Assessment of Quality in Graduate Education*, the report of a study conducted by Allan M. Cartter, and in 1970 published *A Rating of Graduate Programs*, by Kenneth D. Roose and Charles J. Andersen. The Cartter and Roose-Andersen reports have been widely used and frequently cited.

Some years after the release of the Roose-Andersen report, it was decided that the effort to assess the quality of research-doctorate programs should be renewed, and the Conference Board of Associated Research Councils agreed to sponsor an assessment. The Board of Directors of the American Council on Education concurred with the notion that the next study should be issued under these broader auspices. The NRC agreed to serve as secretariat for a new study. The responsible staff of the NRC earned the appreciation of the Conference Board for the skill and dedication shown during the course of securing funding and implementing the study. Special mention should also be made of the financial contribution of the National Academy of Sciences which, by supplementing funds available from external sources, made it possible for the study to get under way.

To sponsor a study comparing the quality of programs in 32 disciplines and from more than 200 doctorate-granting universities is to invite critics, friendly and otherwise. Such was the fate of the previous studies; such has been the fate of the present study. Scholarship, fortunately, can put criticism to creative use and has done so in this project. The study committee appointed by the Conference Board reviewed the criticisms of earlier efforts to assess research-doctorate programs, and it actively solicited criticisms and suggestions for improvements of its own design. Although constrained by limited funds, the committee applied state-of-the-art methodology in a design that incorporated the lessons learned from previous studies as well as attending to many critics of the present effort. Not all criticism has thus been stilled; nor could it ever be. Additional criticisms will be voiced by as many persons as begin to use the results of this effort in ways not anticipated by its authors. These criticisms will be welcome. The Conference Board believes that the present study, building on earlier criticisms and adopting a multidimensional approach to the assessment of research-doctorate programs, represents a substantial improvement over past reports. Nevertheless, each of the diverse measures used here has its own limitations, and none provides a precise index of the quality of a program for educating students for careers in research. No doubt a future study, taking into account the weaknesses as well as strengths of this effort, will represent still further improvement. One mark of success for the present study would be for it to take its place in a continuing series, thereby contributing to the indicator base necessary for informed policies that will maintain and perhaps enhance the quality of the nation's research-doctorate programs.

For the more immediate future the purposes of this assessment are to assist students and student advisers seeking the best match possible between individual career goals and the choice of an advanced degree program; to serve scholars whose study site is higher education and the nation's research enterprise; and to inform the practical judgment of the administrators, funders, and policymakers responsible for protecting the quality of scholarly education in the United States.

A remarkably hard-working and competent group, whose names appear on page vii of this report, oversaw the long process by which this study moved from the planning stage to the completion of these reports. The Conference Board expresses its warmest thanks to the members of its committee and especially to their co-chairmen, Lyle V. Jones and Gardner Lindzey.

Conference Board of Associated
Research Councils

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I

Origins of Study and Selection of Programs

Each year more than 22,000 candidates are awarded doctorates in engineering, the humanities, and the sciences from approximately 250 U.S. universities. They have spent, on the average, five-and-a-half years in intensive education in preparation for research careers either in universities or in settings outside the academic sector, and many will make significant contributions to research. Yet we are poorly informed concerning the quality of the programs producing these graduates. This study is intended to provide information pertinent to this complex and controversial subject.

The charge to the study committee directed it to build upon the planning that preceded it. The planning stages included a detailed review of the methodologies and the results of past studies that had focused on the assessment of doctoral-level programs. The committee has taken into consideration the reactions of various groups and individuals to those studies. The present assessment draws upon previous experience with program evaluation, with the aim of improving what was useful and avoiding some of the difficulties encountered in past studies. The present study, nevertheless, is not purely reactive: it has its own distinctive features. First, it focuses only on programs awarding research doctorates and their effectiveness in preparing students for careers in research. Although other purposes of graduate education are acknowledged to be important, they are outside the scope of this assessment. Second, the study examines a variety of different indices that may be relevant to the program quality. This multidimensional approach represents an explicit recognition of the limitations of studies that rely entirely on peer ratings of perceived quality--the so-called reputational ratings. Finally, in the compilation of reputational ratings in this study, evaluators were provided the names of faculty members involved with each program to be rated and the number of research doctorates awarded in the last five years. In previous reputational studies evaluators were not supplied such information.

During the past two decades increasing attention has been given to describing and measuring the quality of programs in graduate education. It is evident that the assessment of graduate programs is highly important for university administrators and faculty, for employers in industrial and government laboratories, for graduate students and prospective graduate students, for policymakers in state and national organizations, and for private and public funding agencies. Past experience, however, has demonstrated the difficulties with such assessments and their potentially controversial nature. As one critic has asserted:

> . . . the overall effect of these reports seems quite clear. They tend, first, to make the rich richer and the poor poorer; second, the example of the highly ranked clearly imposes constraints on those institutions lower down the scale (the "Hertz-Avis" effect). And the effect of such constraints is to reduce diversity, to reward conformity or respectability, to penalize genuine experiment or risk. There is, also, I believe, an obvious tendency to promote the prevalence of disciplinary dogma and orthodoxy. All of this might be tolerable if the reports were tolerably accurate and judicious, if they were less prescriptive and more descriptive; if they did not pretend to "objectivity" and if the very fact of ranking were not pernicious and invidious; if they genuinely promoted a meaningful "meritocracy" (instead of simply perpetuating the status quo ante and an establishment mentality). But this is precisely what they cannot claim to be or do.[1]

The widespread criticisms of ratings in graduate education were carefully considered in the planning of this study. At the outset consideration was given to whether a national assessment of graduate programs should be undertaken at this time and, if so, what methods should be employed. The next two sections in this chapter examine the background and rationale for the decision by the Conference Board of Associated Research Councils[2] to embark on such a study. The remainder of the chapter describes the selection of disciplines and programs to be covered in the assessment.

The overall study encompasses a total of 2,699 graduate programs in 32 disciplines. In this report--the fourth of five reports issuing from the study--we examine 616 programs in six disciplines in the biological sciences: biochemistry, botany, cellular/molecular biology, microbiology, physiology, and zoology. These programs account for more than 90 percent of the research doctorates awarded in these six disciplines. It should be emphasized that the selection of disciplines to be covered was determined on the basis of total doctoral awards during the FY1976-78 period (as described later in this chapter), and the exclusion of a particular discipline was in no way based on a judgment of the importance of graduate education or research in that discipline. Also, although the assessment is limited to programs leading to the research-doctorate (Ph.D. or equivalent) degree, the Conference Board and study committee recognize that graduate schools provide many other forms of valuable and needed education.

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[1] William A. Arrowsmith, "Preface" in The Ranking Game: The Power of the Academic Elite, by W. Patrick Dolan, University of Nebraska Printing and Duplicating Service, Lincoln, Nebraska, 1976, p. ix.

[2] The Conference Board includes representatives of the American Council of Learned Societies, American Council on Education, National Research Council, and Social Science Research Council.

PRIOR ATTEMPTS TO ASSESS QUALITY IN GRADUATE EDUCATION

Universities and affiliated organizations have taken the lead in the review of programs in graduate education. At most institutions program reviews are carried out on a regular basis and include a comprehensive examination of the curriculum and educational resources as well as the qualifications of faculty and students. One special form of evaluation is that associated with institutional accreditation:

> The process begins with the institutional or programmatic self-study, a comprehensive effort to measure progress according to previously accepted objectives. The self-study considers the interest of a broad cross-section of constituencies--students, faculty, administrators, alumni, trustees, and in some circumstances the local community. The resulting report is reviewed by the appropriate accrediting commission and serves as the basis for evaluation by a site-visit team from the accrediting group. . . . Public as well as educational needs must be served simultaneously in determining and fostering standards of quality and integrity in the institutions and such specialized programs as they offer. Accreditation, conducted through nongovernmental institutional and specialized agencies, provides a major means for meeting those needs.[3]

Although formal accreditation procedures play an important role in higher education, many university administrators do not view such procedures as an adequate means of assessing program quality. Other efforts are being made by universities to evaluate their programs in graduate education. The Educational Testing Service, with the sponsorship of the Council of Graduate Schools in the United States and the Graduate Record Examinations Board, has recently developed a set of procedures to assist institutions in evaluating their own graduate programs.[4]

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[3] Council on Postsecondary Accreditation, The Balance Wheel for Accreditation, Washington, D.C., July 1981, pp. 2-3.

While reviews at the institutional (or state) level have proven useful in assessing the relative strengths and weaknesses of individual programs, they have not provided the information required for making national comparisons of graduate programs. Several attempts have been made at such comparisons. The most widely used of these have been the studies by Keniston (1959), Cartter (1966), and Roose and Andersen (1970). All three studies covered a broad range of disciplines in engineering, the humanities, and the sciences and were based on the opinions of knowledgeable individuals in the program areas covered. Keniston[5] surveyed the department chairmen at 25 leading institutions. The Cartter[6] and Roose-Andersen[7] studies compiled ratings from much larger groups of faculty peers. The stated motivation for these studies was to increase knowledge concerning the quality of graduate education:

> A number of reasons can be advanced for undertaking such a study. The diversity of the American system of higher education has properly been regarded by both the professional educator and the layman as a great source of strength, since it permits flexibility and adaptability and encourages experimentation and competing solutions to common problems. Yet diversity also poses problems. . . . Diversity can be a costly luxury if it is accompanied by ignorance. . . . Just as consumer knowledge and honest advertising are requisite if a competitive economy is to work satisfactorily, so an improved knowledge of opportunities and of quality is desirable if a diverse educational system is to work effectively.[8]

Although the program ratings from the Cartter and Roose-Andersen studies are highly correlated, some substantial differences in successive ratings can be detected for a small number of programs--suggesting changes in the programs or in the perception of the programs. For the past decade the Roose-Andersen ratings have generally been regarded as the best available source of information on the quality of doctoral programs. Although the ratings are now more than 10 years out of date and have been criticized on a variety of grounds, they are still used extensively by individuals within the academic community and by those in federal and state agencies.

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[4] For a description of these procedures, see M. J. Clark, Graduate Program Self-Assessment Service: Handbook for Users, Educational Testing Service, Princeton, New Jersey, 1980.

[5] H. Keniston, Graduate Study in Research in the Arts and Sciences at the University of Pennsylvania, University of Pennsylvania Press, Philadelphia, 1959.

[6] A. M. Cartter, An Assessment of Quality in Graduate Education, American Council on Education, Washington, D.C., 1966.

[7] K. D. Roose and C. J. Andersen, A Rating of Graduate Programs, American Council on Education, Washington, D.C., 1970.

[8] Cartter, p. 3.

A frequently cited criticism of the Cartter and Roose-Andersen studies is their exclusive reliance upon reputational measurement.

> The ACE rankings are but a small part of all the evaluative processes, but they are also the most public, and they are clearly based on the narrow assumptions and elitist structures that so dominate the present direction of higher education in the United States. As long as our most prestigious source of information about postsecondary education is a vague popularity contest, the resultant ignorance will continue to provide a cover for the repetitious aping of a single model. . . . All the attempts to change higher education will ultimately be strangled by the "legitimate" evaluative processes that have already programmed a single set of responses from the start.[9]

A number of other criticisms have been leveled at reputational rankings of graduate programs.[10] First, such studies inherently reflect perceptions that may be several years out of date and do not take into account recent changes in a program. Second, the ratings of individual programs are likely to be influenced by the overall reputation of the university--i.e., an institutional "halo effect." Also, a disproportionately large fraction of the evaluators are graduates of and/or faculty members in the largest programs, which may bias the survey results. Finally, on the basis of such studies it may not be possible to differentiate among many of the lesser known programs in which relatively few faculty members have established national reputations in research.

Despite such criticisms several studies based on methodologies similar to those employed by Cartter and Roose and Andersen have been carried out during the past 10 years. Some of these studies evaluated post-baccalaureate programs in areas not covered in the two earlier reports--including business, religion, educational administration, and medicine. Others have focused exclusively on programs in particular disciplines within the sciences and humanities. A few attempts have been made to assess graduate programs in a broad range of disciplines, many of which were covered in the Roose-Andersen and Cartter ratings, but in the opinion of many each has serious deficiencies in the methods and procedures employed. In addition to such studies, a myriad of articles have been written on the assessment of graduate programs since the release of the Roose-Andersen report. With the heightening interest in these evaluations, many in the academic community have recognized the need to assess graduate programs, using other criteria in addition to peer judgment.

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[9] Dolan, p. 81.

[10] For a discussion of these criticisms, see David S. Webster, "Methods of Assessing Quality," Change, October 1981, pp. 20-24.

> Though carefully done and useful in a number of ways, these ratings (Cartter and Roose-Andersen) have been criticized for their failure to reflect the complexity of graduate programs, their tendency to emphasize the traditional values that are highly related to program size and wealth, and their lack of timeliness or currency. Rather than repeat such ratings, many members of the graduate community have voiced a preference for developing ways to assess the quality of graduate programs that would be more comprehensive, sensitive to the different program purposes, and appropriate for use at any time by individual departments or universities.[11]

Several attempts have been made to go beyond the reputational assessment. Clark, Harnett, and Baird, in a pilot study[12] of graduate programs in chemistry, history, and psychology, identified as many as 30 possible measures significant for assessing the quality of graduate education. Glower[13] has ranked engineering schools according to the total amount of research spending and the number of graduates listed in Who's Who in Engineering. House and Yeager[14] rated economics departments on the basis of the total number of pages published by full professors in 45 leading journals in this discipline. Other ratings based on faculty publication records have been compiled for graduate programs in a variety of disciplines, including political science, psychology, and sociology. These and other studies demonstrate the feasibility of a national assessment of graduate programs that is founded on more than reputational standing among faculty peers.

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[11] Clark, p. 1.

[12] M. J. Clark, R. T. Harnett, and L. L. Baird, Assessing Dimensions of Quality in Doctoral Education: A Technical Report of a National Study in Three Fields, Educational Testing Service, Princeton, New Jersey, 1976.

[13] Donald D. Glower, "A Rational Method for Ranking Engineering Programs," Engineering Education, May 1980.

[14] Donald R. House and James H. Yeager, Jr., "The Distribution of Publication Success Within and Among Top Economics Departments: A Disaggregate View of Recent Evidence," Economic Inquiry, Vol. 16, No. 4, October 1978, pp. 593-598.

DEVELOPMENT OF STUDY PLANS

In September 1976 the Conference Board, with support from the Carnegie Corporation of New York and the Andrew W. Mellon Foundation, convened a three-day meeting to consider whether a study of programs in graduate education should be undertaken. The 40 invited participants in this meeting included academic administrators, faculty members, and agency and foundation officials[15] and represented a variety of institutions, disciplines, and convictions. In these discussions there was considerable debate concerning whether the potential benefits of such a study outweighed the possible misrepresentations of the results. On the one hand, "a substantial majority of the Conference [participants believed] that the earlier assessments of graduate education have received wide and important use: by students and their advisors, by the institutions of higher education as aids to planning and the allocation of educational functions, as a check on unwarranted claims of excellence, and in social science research."[16] On the other hand, the conference participants recognized that a new study assessing the quality of graduate education "would be conducted and received in a very different atmosphere than were the earlier Cartter and Roose-Andersen reports. . . . Where ratings were previously used in deciding where to increase funds and how to balance expanding programs, they might now be used in deciding where to cut off funds and programs."

After an extended debate of these issues, it was the recommendation of this conference that a study with particular emphasis on the effectiveness of doctoral programs in educating research personnel be undertaken. The recommendation was based principally on four considerations:

(1) the importance of the study results to national and state bodies,
(2) the desire to stimulate continuing emphasis on quality in graduate education,
(3) the need for current evaluations that take into account the many changes that have occurred in programs since the Roose-Andersen study, and
(4) the value of extending the range of measures used in evaluative studies of graduate programs.

Although many participants expressed interest in an assessment of master's degree and professional degree programs, insurmountable problems prohibited the inclusion of these types of programs in this study.

Following this meeting a 13-member committee,[17] co-chaired by Gardner Lindzey and Harriet A. Zuckerman, was formed to develop a detailed plan for a study limited to research-doctorate programs and designed to improve upon the methodologies utilized in earlier studies. In its deliberations the planning committee carefully considered the criticisms of the Roose-Andersen study and other national assessments. Particular attention was paid to the feasibility of compiling a variety of specific measures (e.g., faculty publication records, quality of students, program resources) that were judged to be related to the quality of research-doctorate programs. Attention was also given to making improvements in the survey instrument and procedures used in the Cartter and Roose-Andersen studies. In September 1978 the planning group submitted a comprehensive report describing alternative strategies for an evaluation of the quality and effectiveness of research-doctorate programs.

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[15] See Appendix G for a list of the participants in this conference.

[16] From a summary of the Woods Hole Conference (see Appendix G).

[17] See Appendix H for a list of members of the planning committee.

> The proposed study has its own distinctive features. It is characterized by a sharp focus and a multidimensional approach. (1) It will focus only on programs awarding research doctorates; other purposes of doctoral training are acknowledged to be important, but they are outside the scope of the work contemplated. (2) The multidimensional approach represents an explicit recognition of the limitations of studies that make assessments solely in terms of ratings of perceived quality provided by peers--the so-called reputational ratings. Consequently, a variety of quality-related measures will be employed in the proposed study and will be incorporated in the presentation of the results of the study.[18]

This report formed the basis for the decision by the Conference Board to embark on a national assessment of doctorate-level programs in the sciences, engineering, and the humanities.

In June 1980 an 18-member committee was appointed to oversee the study. The committee,[19] made up of individuals from a diverse set of disciplines within the sciences, engineering, and the humanities, includes seven members who had been involved in the planning phase and several members who presently serve or have served as graduate deans in either public or private universities. During the first eight months the committee met three times to review plans for the study activities, make decisions on the selection of disciplines and programs to be covered, and design the survey instruments to be used. Early in the study an effort was made to solicit the views of presidents and graduate deans at more than 250 universities. Their suggestions were most helpful to the committee in drawing up final plans for the assessment. With the assistance of the Council of Graduate Schools in the

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[18] National Research Council, A Plan to Study the Quality and Effectiveness of Research-Doctorate Programs, 1978 (unpublished report).

[19] See p. vii of this volume for a list of members of the study committee.

United States, the committee and its staff have tried to keep the graduate deans informed about the progress being made in this study. The final section of this chapter describes the procedures followed in determining which research-doctorate programs were to be included in the assessment.

SELECTION OF DISCIPLINES AND PROGRAMS TO BE EVALUATED

One of the most difficult decisions made by the study committee was the selection of disciplines to be covered in the assessment. Early in the planning stage it was recognized that some important areas of graduate education would have to be left out of the study. Limited financial resources required that efforts be concentrated on a total of no more than about 30 disciplines in the biological sciences, engineering, humanities, mathematical and physical sciences, and social sciences. At its initial meeting the committee decided that the selection of disciplines within each of these five areas should be made primarily on the basis of the total number of doctorates awarded nationally in recent years.

At the time the study was undertaken, aggregate counts of doctoral degrees earned during the FY1976-78 period were available from two independent sources--the Educational Testing Service (ETS) and the National Research Council (NRC). Table 1.1 presents doctoral awards data for 19 disciplines within the life sciences (including biological and agricultural sciences). As alluded to in footnote 1 of the table, discrepancies between the ETS and NRC counts may be explained, in part, by differences in the data collection procedures. The ETS counts, derived from information provided by universities, have been categorized according to the discipline of the department/academic unit in which the degree was earned. The NRC counts were tabulated from the survey responses of FY1976-78 Ph.D. recipients, who had been asked to identify their fields of specialty. Since separate totals for research doctorates in anatomy, biophysics, cellular/molecular biology, ecology, genetics, pathology, pharmacology, and physiology were not available from the ETS manual, the committee made its selection of six disciplines primarily on the basis of the NRC data. In the case of cellular/molecular biology, consideration was given to the fact that the NRC count excludes doctoral awards in genetics, anatomy, developmental biology, and other related fields and thus substantially underestimates the total number of doctorates in cellular/molecular biology.[20]

The selection of biological science disciplines to be covered in the assessment was especially difficult since there are differing opinions within the scientific community concerning the most appropri-

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[20] Evidence for this may be found from the data provided by institutional coordinators, who reported that a total of 1,871 doctoral recipients graduated from 89 cellular/molecular biology programs during the FY1976-80 period. See Table 1.2, p. 13.

TABLE 1.1 Number of Research-Doctorates Awarded in Biological Science Disciplines, FY1976-78

	Source of Data[1]	
	ETS	NRC
Disciplines Included in the Assessment		
Biochemistry	1,428	1,833
Microbiology	1,094	1,358
Zoology	1,045	743
Botany	869	890
Physiology	N/A	921
Cellular/Molecular Biology[2]	N/A	567
Total		6,312
Disciplines Not Included in the Assessment		
Public Health	647	372
Forestry & Natural Resources Mgmt.	620	416
Agronomy & Soil Sciences	616	642
Animal Sciences	521	321
Entomology	482	443
Agricultural Economics	477	464
Horticulture	197	176
Pharmacology	N/A	614
Ecology	N/A	473
Genetics	N/A	409
Anatomy	N/A	392
Biophysics	N/A	375
Pathology	N/A	282
Other Biological Sciences	N/A	2,671
TOTAL		8,050

[1] Data on FY1976-78 doctoral awards were derived from two independent sources: Educational Testing Service (ETS), Graduate Programs and Admissions Manual, 1979-81, and the NRC's Survey of Earned Doctorates, 1976-78. Differences in field definitions account for discrepancies between the ETS and NRC data.

[2] NRC data exclude doctoral awards in genetics, anatomy, developmental biology, and other related fields and thus substantially underestimate the number of doctorates in cellular/molecular biology.

ate taxonomy of biological fields in graduate education and research. Several knowledgeable individuals were consulted regarding this matter. The taxonomy the committee decided to use in this assessment, although considered by some to be out of date, reflects the departmental structure commonly found in graduate institutions. Some readers may be surprised not to find biology among the six disciplines selected. Since biology encompasses many different biological science disciplines, members of the committee were concerned that a university coordinator, when asked to identify research-doctorate programs to be included in the assessment, might have considerable difficulty in deciding whether a particular biological science program belonged under "biology" or one of the other disciplinary categories. It should be noted that many programs found in departments of biology have been included in the assessment of programs in cellular/molecular biology. In addition, programs from departments of anatomy, biochemistry, biophysics, cell biology, developmental biology, and genetics have been included in the assessment in cellular and molecular biology (see Table 5.1 in Chapter V).

The selection of the research-doctorate programs to be evaluated in each discipline was made in two stages. Programs meeting either of the following criteria[21] were initially nominated for inclusion in the study:

(1) more than a specified number (see below) of research doctorates awarded during the FY1976-78 period or
(2) more than one-third of that specified number of doctorates awarded in FY1979.

In each discipline the specified number of doctorates required for inclusion in the study was determined in such a way that the programs meeting this criterion accounted for at least 90 percent of the doctorates awarded in that discipline during the FY1976-78 period. In the biological science disciplines the following numbers of FY1976-78 doctoral awards were required to satisfy the first criterion (above):

Biochemistry--5 or more doctorates
Botany--7 or more doctorates
Cellular/Molecular Biology--10 or more doctorates
Microbiology--4 or more doctorates
Physiology--11 or more doctorates
Zoology--8 or more doctorates

A list of the nominated programs at each institution was then sent to a designated individual (usually the graduate dean) who had been appointed by the university president to serve as study coordinator for the institution. The coordinator was asked to review the list and eliminate any programs no longer offering research doctorates or notbelonging in the designated discipline. The coordinator also was given an opportunity to nominate additional programs that he or she believed should be included in the study.[22] Coordinators were asked to restrict their nominations to programs that they considered to be "of uncommon distinction" and that had awarded no fewer than two research-doctorates during the past two years. In order to be eligible for inclusion, of course, programs had to belong in one of the disciplines covered in the study. If the university offered more than one research-doctorate program in a discipline, the coordinator was instructed to provide information on each of them so that these programs could be evaluated separately. In each of the six biological science disciplines it was not unusual for a university to have separate programs from the graduate school of arts and sciences and from the medical school, school of agriculture, or the school of public health. In such cases the separate programs have been identified according to the schools in which they reside within the university. In many institutions research-doctorate programs that have been identified as being located in academic units other than arts and sciences nonetheless are considered within the academic structure of the graduate school.

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[21] In the first three volumes of the committee's study, which pertain to the mathematical and physical sciences, humanities, and engineering, it is mistakenly reported that a third criterion based on results from the Roose-Andersen study was used in the nomination of programs to be included in the assessment. This third criterion, while at one time considered by the committee, was not adopted.

The committee received excellent cooperation from the study coordinators at universities. Of the 243 institutions that were identified as having one or more research-doctorate programs satisfying the criteria (listed earlier) for inclusion in the study, only 7 declined to participate in the study and another 8 failed to provide the program information requested within the three-month period allotted (despite several reminders). None of these 15 institutions had doctoral programs that had received strong or distinguished reputational ratings in prior national studies. Since the information requested had not been provided, the committee decided not to include programs from these institutions in any aspect of the assessment. In each of the six chapters that follows, a list is given of the universities that met the criteria for inclusion in a particular discipline but that are not represented in the study.

As a result of nominations by institutional coordinators, some programs were added to the original list and others dropped. Table 1.2 reports the final coverage in each of the six biological science disciplines. The number of programs evaluated varies considerably by discipline. A total of 139 biochemistry and 134 microbiology programs have been included in the study; in zoology only about half this number have been included. Although the final determination of whether a program should be considered in the assessment was left in the hands of the institutional coordinator, it is entirely possible that a few programs meeting the criteria for inclusion in the assessment were overlooked

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[22] See Appendix A for the specific instructions given to the coordinators.

TABLE 1.2 Number of Programs Evaluated in Each Discipline and the Total FY1976-80 Doctoral Awards from These Programs

Discipline	Programs	FY1976-80 Doctorates*
Biochemistry	139	2,753
Botany	83	1,574
Cellular/Molecular Biology	89	1,871
Microbiology	134	2,058
Physiology	101	1,369
Zoology	70	1,753
TOTAL	616	11,378

*The data on doctoral awards were provided by the study coordinator at each of the universities covered in the assessment.

by the coordinators. Of particular concern in this regard is the selection of cellular/molecular biology programs. Because of the diversity of departmental structures within universities, one is likely to find inconsistencies in the identification of research-doctorate programs in this discipline. For example, some coordinators decided to include programs in departments of genetics and anatomy, while others chose to exclude such programs.

In the chapter that follows, a detailed description is given of each of the measures used in the evaluation of research-doctorate programs in the biological sciences. The description includes a discussion of the rationale for using the measure, the source from which data for that measure were derived, and any known limitations that would affect the interpretation of the data reported. The committee wishes to emphasize that there are limitations associated with each of the measures and that none of the measures should be regarded as a precise indicator of the quality of a program in educating scientists for careers in research. The reader is strongly urged to consider the descriptive material presented in Chapter II before attempting to interpret the program evaluations reported in subsequent chapters. In presenting a frank discussion of any shortcomings of each measure, the committee's intent is to reduce the possibility of misuse of the results from this assessment of research-doctorate programs.

II

Methodology

> Quality . . . you know what it is, yet you don't know what it is. But that's self-contradictory. But some things are better than others, that is, they have more quality. But when you try to say what the quality is, apart from the things that have it, it all goes poof! There's nothing to talk about. But if you can't say what Quality is, how do you know what it is, or how do you know that it even exists? If no one knows what it is, then for all practical purposes it doesn't exist at all. But for all practical purposes it really does exist. What else are the grades based on? Why else would people pay fortunes for some things and throw others in the trash pile? Obviously some things are better than others . . . but what's the "betterness"? . . . So round and round you go, spinning mental wheels and nowhere finding anyplace to get traction. What the hell is Quality? What is it?
>
> Robert M. Pirsig
> Zen and the Art of
> Motorcycle Maintenance

Both the planning committee and our own study committee have given careful consideration to the types of measures to be employed in the assessment of research-doctorate programs.[1] The committees recognized that any of the measures that might be used is open to criticism and that no single measure could be expected to provide an entirely satisfactory index of the quality of graduate education. With respect to the use of multiple criteria in educational assessment, one critic has commented:

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[1] A description of the measures considered may be found in the third chapter of the planning committee's report, along with a discussion of the relative merits of each measure.

> At best each is a partial measure encompassing a fraction of the large concept. On occasion its link to the real [world] is problematic and tenuous. Moreover, each measure [may contain] a load of irrelevant superfluities, "extra baggage" unrelated to the outcomes under study. By the use of a number of such measures, each contributing a different facet of information, we can limit the effect of irrelevancies and develop a more rounded and truer picture of program outcomes.[2]

Although the use of multiple measures alleviates the criticisms directed at a single dimension or measure, it certainly will not satisfy those who believe that the quality of graduate programs cannot be represented by quantitative estimates no matter how many dimensions they may be intended to represent. Furthermore, the usefulness of the assessment is dependent on the validity and reliability of the criteria on which programs are evaluated. The decision concerning which measures to adopt in the study was made primarily on the basis of two factors:

(1) the extent to which a measure was judged to be related to the quality of research-doctorate programs and
(2) the feasibility of compiling reliable data for making national comparisons of programs in particular disciplines.

Only measures that were applicable to a majority of the disciplines to be covered were considered. In reaching a final decision the study committee found the ETS study,[3] in which 27 separate variables were examined, especially helpful, even though it was recognized that many of the measures feasible in institutional self-studies would not be available in a national study. The committee was aided by the many suggestions received from university administrators and others within the academic community.

Although the initial design called for an assessment based on approximately six measures, the committee concluded that it would be highly desirable to expand this effort. As many as 16 measures (listed in Table 2.1) have been utilized in the assessment of research-doctorate programs in biochemistry, botany, cellular/molecular biology, microbiology, physiology, and zoology. For nine of the measures data are available describing most, if not all, of the biological science programs included in the assessment. For seven measures the coverage is less complete but encompasses a large fraction of the programs in

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[2] C. H. Weiss, Evaluation Research: Methods of Assessing Program Effectiveness, Prentice-Hall, Inc., Englewood Cliffs, New Jersey, 1972, p. 56.

[3] See M. J. Clark et al. (1976) for a description of these variables.

R6000-14.4

This page is a duplicate of Table 2.1 and may be used as a guide to program measures by placing it beside the tables under examination.

MEASURES COMPILED ON INDIVIDUAL RESEARCH-DOCTORATE PROGRAMS IN THE BIOLOGICAL SCIENCES

Program Size[1] (See pages 18-19.)

01 Reported number of faculty members in the program, December 1980.

02 Reported number of program graduates in last five years (July 1975 through June 1980).

03 Reported total number of full-time and part-time graduate students enrolled in the program who intend to earn doctorates, December 1980.

Characteristics of Graduates[2] (See pages 19-22.)

04 Fraction of FY1975-79 program graduates who had received some national fellowship or training grant support during their graduate education.

05 Median number of years from first enrollment in graduate school to receipt of the doctorate--FY1975-79 program graduates.[3]

06 Fraction of FY1975-79 program graduates who at the time they completed requirements for the doctorate reported that they had made definite commitments for postgraduation employment.

07 Fraction of FY1975-79 program graduates who at the time they completed requirements for the doctorate reported that they had made definite commitments for postgraduation employment in Ph.D.-granting universities.

Reputational Survey Results[4] (See pages 22-27.)

08 Mean rating of the scholarly quality of program faculty (scale = 0 to 5).

09 Mean rating of the effectiveness of the program in educating research scholars/scientists (scale = 0 to 3).

10 Mean rating of the improvement in program quality in the last five years (scale = 0 to 2).

11 Mean rating of the evaluators' familiarity with the work of the program's faculty (scale = 0 to 2).

University Library Size[5] (See pages 27-28.)

12 Composite index describing the library size in the university in which the program is located, 1979-80 (scale = -3 to +3).

Research Support (See pages 28-29.)

13 Fraction of program faculty members holding research grants from the National Institutes of Health, the National Science Foundation, or the Alcohol, Drug Abuse, and Mental Health Administration at any time during the FY1978-80 period.[6]

14 Total expenditures reported by the university for research and development activities in a specified field, FY1979[7] (in thousands of dollars).

Publication Records[8] (See pages 29-31.)

15 Number of published articles attributed to the program, 1978-79.

16 Estimated "overall influence" of published articles attributed to the program, 1978-79 (raw values are not reported).

[1] Based on information provided to the committee by the participating universities.

[2] Based on data compiled in the NRC's Survey of Earned Doctorates.

[3] In reporting standardized scores and correlations with other variables, a shorter time-to-Ph.D. is assigned a higher score.

[4] Based on responses to the committee's survey conducted in April 1981.

[5] Based on data compiled by the Association of Research Libraries.

[6] Based on matching faculty names provided by institutional coordinators with the names of research grant awardees from the three federal agencies.

[7] Based on data provided to the National Science Foundation by universities.

[8] Based on data compiled by the Institute for Scientific Information and developed by Computer Horizons, Inc.

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TABLE 2.1 Measures Compiled on Individual Research-Doctorate Programs in the Biological Sciences

Program Size[1]

01 Reported number of faculty members in the program, December 1980.

02 Reported number of program graduates in last five years (July 1975 through June 1980).

03 Reported total number of full-time and part-time graduate students enrolled in the program who intend to earn doctorates, December 1980.

Characteristics of Graduates[2]

04 Fraction of FY1975-79 program graduates who had received some national fellowship or training grant support during their graduate education.

05 Median number of years from first enrollment in graduate school to receipt of the doctorate--FY1975-79 program graduates.[3]

06 Fraction of FY1975-79 program graduates who at the time they completed requirements for the doctorate reported that they had made definite commitments for postgraduation employment.

07 Fraction of FY1975-79 program graduates who at the time they completed requirements for the doctorate reported that they had made definite commitments for postgraduation employment in Ph.D.-granting universities.

Reputational Survey Results[4]

08 Mean rating of the scholarly quality of program faculty.

09 Mean rating of the effectiveness of the program in educating research scholars/scientists.

10 Mean rating of the improvement in program quality in the last five years.

11 Mean rating of the evaluators' familiarity with the work of the program's faculty.

University Library Size[5]

12 Composite index describing the library size in the university in which the program is located, 1979-80.

Research Support

13 Fraction of program faculty members holding research grants from the National Institutes of Health, the National Science Foundation, or the Alcohol, Drug Abuse, and Mental Health Administration at any time during the FY1978-80 period.[6]

14 Total expenditures (in thousands of dollars) reported by the university for research and development activities in a specified field, FY1979.[7]

Publication Records[8]

15 Number of published articles attributed to the program, 1978-79.

16 Estimated "overall influence" of published articles attributed to the program, 1978-79.

[1] Based on information provided to the committee by the participating universities.

[2] Based on data compiled in the NRC's Survey of Earned Doctorates.

[3] In reporting standardized scores and correlations with other variables, a shorter time-to-Ph.D. is assigned a higher score.

[4] Based on responses to the committee's survey conducted in April 1981.

[5] Based on data compiled by the Association of Research Libraries.

[6] Based on matching faculty names provided by institutional coordinators with the names of research grant awardees from the three federal agencies.

[7] Based on data provided to the National Science Foundation by universities.

[8] Based on data compiled by the Institute for Scientific Information and developed by Computer Horizons, Inc.

every discipline. The actual number of programs evaluated on every measure is reported in the second table in each of the next six chapters.

The 16 measures describe a variety of aspects important to the operation and function of research-doctorate programs--and thus are relevant to the quality and effectiveness of programs in educating scientists for careers in research. However, not all of the measures may be viewed as "global indices of quality." Some, such as those relating to program size, are best characterized as "program descriptors" that, although not dimensions of quality per se, are thought to have a significant influence on the effectiveness of programs. Other measures, such as those relating to university library size and support for research and training, describe some of the resources generally recognized as being important in maintaining a vibrant program in graduate education. Measures derived from surveys of faculty peers or from the publication records of faculty members, on the other hand, have traditionally been regarded as indices of the overall quality of graduate programs. Yet these too are not true measures of quality.

> We often settle for an easy-to-gather statistic, perfectly legitimate for its own limited purposes, and then forget that we haven't measured what we want to talk about. Consider, for instance, the reputation approach of ranking graduate departments: We ask a sample of physics professors (say) which the best physics departments are and then tabulate and report the results. The "best" departments are those that our respondents say are the best. Clearly it is useful to know which are the highly regarded departments in a given field, but prestige (which is what we are measuring here) isn't exactly the same as quality.*

To be sure, each of the 16 measures reported in this assessment has its own set of limitations. In the sections that follow an explanation is provided of how each measure has been derived and its particular limitations as a descriptor of research-doctorate programs.

PROGRAM SIZE

Information was collected from the study coordinators at each university on the names and ranks of program faculty, doctoral student enrollment, and number of Ph.D. graduates in each of the past five years (FY1976-80). Each coordinator was instructed to include on the faculty list those individuals who, as of December 1, 1980, held academic appointments (typically at the rank of assistant, associate, and full professor) and who participated significantly in doctoral education. Emeritus and adjunct members generally were not to be included. Measure 01 represents the number of faculty identified in a program. Measure 02 is the reported number of graduates who earned Ph.D. or equivalent research doctorates in a program during the period from July 1, 1975, through June 30, 1980. Measure 03 represents the total number of full-time and part-time students reported to be enrolled in a program in the fall of 1980, who intended to earn research doctorates. All three of these measures describe different aspects of program size. In previous studies program size has been shown to be highly correlated with the reputational ratings of a program, and this relationship is examined in detail in this report. It should be noted that since the information was provided by the institutions participating in the study, the data may be influenced by the subjective decisions made by the individuals completing the forms. For example, some institutional coordinators may be far less restrictive than others in deciding who should be included on the list of program faculty. To minimize variation in interpretation, detailed instructions were provided to those filling out the forms.[5] Measure 03 is of particular concern in this regard since the coordinators at some institutions may not have known how many of the students currently enrolled in graduate study intended to earn doctoral degrees.

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*John Shelton Reed, "How Not To Measure What a University Does," The Chronicle of Higher Education, Vol. 22, No. 12, May 11, 1981, p. 56.

CHARACTERISTICS OF GRADUATES

One of the most meaningful measures of the success of a research-doctorate program is the performance of its graduates. How many go on to lead productive careers in research and/or teaching? Unfortunately, reliable information on the subsequent employment and career achievements of the graduates of individual programs is not available. In the absence of this directly relevant information, the committee has relied on four indirect measures derived from data compiled in the NRC's Survey of Earned Doctorates.[6] Although each measure has serious limitations (described below), the committee believes it more desirable to include this information than not to include data about program graduates.

In identifying program graduates who had received their doctorates in the previous five years (FY1975-79),[7] the faculty lists furnished by the study coordinators at universities were compared with the names of dissertation advisers (available from the NRC survey). The latter source contains records for virtually all individuals who have earned research doctorates from U.S. universities since 1920. The institution, year, and specialty field of Ph.D. recipients were also used in determining the identity of program graduates. It is estimated that this matching process provided information on the graduate training and employment plans of more than 80 percent of the FY1975-79 graduates from the biological science programs. In the calculation of each of the four measures derived from the NRC survey, program data are reported only if the survey information is available on at least 10 graduates. Consequently, in a discipline with smaller programs--physiology--slightly less than half the programs are included in these measures, whereas more than 80 percent of the zoology programs are included.

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[5] A copy of the survey form with the instructions sent to study coordinators is included in Appendix A.

[6] A copy of the questionnaire used in this survey is found in Appendix B.

[7] Survey data for the FY1980 Ph.D. recipients had not yet been compiled at the time this assessment was undertaken.

Measure 04 constitutes the fraction of FY1975-79 graduates of a program who had received at least some national fellowship support, including National Institutes of Health fellowships or traineeships, National Science Foundation fellowships, other federal fellowships, Woodrow Wilson fellowships, or fellowships/traineeships from other U.S. national organizations. One might expect the more selective programs to have a greater proportion of students with national fellowship support--especially "portable fellowships." Although the committee considered alternative measures of student ability (e.g., Graduate Record Examination scores, undergraduate grade point averages), reliable information of this sort was unavailable for a national assessment. It should be noted that the relevance of the fellowship measure varies considerably among disciplines. In the biomedical sciences a substantial fraction of the graduate students are supported by training grants and fellowships; in most other sciences and engineering disciplines a majority are supported by research assistantships and teaching assistantships. Even in the biological disciplines, however, differences in the patterns of graduate student support at different universities may sharply affect measure 04. Some departments with sizable undergraduate enrollments, for example, may have large numbers of teaching assistantships paid out of state or institutional funds--thereby reducing the need for federal training grant or fellowship support. Similarly, some departments may have an established policy of supporting graduate students as research assistants rather than seeking federal training grant support for their students.

Measure 05 is the median number of years elapsed from the time program graduates first enrolled in graduate school to the time they received their doctoral degrees. For purposes of analysis the committee has adopted the conventional wisdom that the most talented students are likely to earn their doctoral degrees in the shortest periods of time--hence, the shorter the median time-to-Ph.D., the higher the standardized score that is assigned. Although this measure has frequently been employed in social science research as a proxy for student ability, one must regard its use here with some skepticism. It is quite possible that the length of time it takes a student to complete requirements for a doctorate may be significantly affected by the explicit or implicit policies of a university or department. For example, in certain cases a short time-to-Ph.D. may be indicative of less stringent requirements for the degree. Furthermore, previous studies have demonstrated that women and members of minority groups, for reasons having nothing to do with their abilities, are more likely than male Caucasians to interrupt their graduate education or to be enrolled on a part-time basis.[8] As a consequence, the median time-to-Ph.D. may be longer for programs with larger fractions of women and minority students.

Measure 06 represents the fraction of FY1975-79 program graduates who reported at the time they had completed requirements for the doctorate that they had signed contracts or made firm commitments for postgraduation employment (including postdoctoral appointments as well as other positions in the academic or nonacademic sectors) and who provided the names of their prospective employers. Although this measure is likely to vary discipline by discipline according to the availability of employment opportunities, a program's standing relative to other programs in the same discipline should not be affected by this variation. In theory, the graduates with the greatest promise should have the easiest time in finding jobs. However, the measure is also influenced by a variety of other factors, such as personal job preferences and restrictions in geographic mobility, that are unrelated to the ability of the individual. It also should be noted parenthetically that unemployment rates for doctoral recipients are quite low and that nearly all of the graduates seeking jobs find positions soon after completing their doctoral programs.[9] Furthermore, first employment after graduation is by no means a measure of career achievement, which is what one would like to have if reliable data were available.

Measure 07, a variant of measure 06, constitutes the fraction of FY1975-79 program graduates who indicated that they had made firm commitments for employment in Ph.D.-granting universities and who provided the names of their prospective employers. This measure may be presumed to be an indication of the fraction of graduates likely to pursue careers in academic research, although there is no evidence concerning how many of them remain in academic research in the long term. In many science disciplines the path from Ph.D. to postdoctoral apprenticeship to junior faculty has traditionally been regarded as the road of success for the growth and development of research talent. The committee is well aware, of course, that other paths, such as employment in the major laboratories of industry and government, provide equally attractive opportunities for growth. Indeed, in recent years increasing numbers of graduates are entering the nonacademic sectors. Unfortunately the data compiled from the NRC's Survey of Earned Doctorates do

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[8] For a detailed analysis of this subject, see Dorothy M. Gilford and Joan Snyder, Women and Minority Ph.D.'s in the 1970's: A Data Book, National Academy of Sciences, Washington, D.C., 1977.

[9] For new Ph.D. recipients in science and engineering the unemployment rate has been less than 2 percent (see National Research Council, Postdoctoral Appointments and Disappointments, National Academy Press, Washington, D.C., 1981, p. 313).

TABLE 2.2 Percentage of FY1975-79 Doctoral Recipients with Definite Commitments for Employment Outside the Academic Sector*

Biochemistry	22
Botany	28
Cellular/Molecular Biology	22
Microbiology	31
Physiology	16
Zoology	24

*Percentages are based on responses to the NRC's Survey of Earned Doctorates by those who indicated that they had made firm commitments for postgraduation employment and who provided the names of their prospective employers. These percentages may be considered to be lower-bound estimates of the actual percentages of doctoral recipients employed outside the academic sector.

not enable one to distinguish between employment in the top-flight laboratories of industry and government and employment in other areas of the nonacademic sectors. Accordingly, the committee has relied on a measure that reflects only the academic side and views this measure as a useful and interesting program characteristic rather than a dimension of quality. In the biological science disciplines, in which only about one-fourth of the graduates take jobs outside the academic environs (see Table 2.2), this limitation is not as serious a concern as it is in the engineering and physical science disciplines.

The inclusion of measures 06 and 07 in this assessment has been an issue much debated by members of the committee; the strenuous objections by three committee members regarding the use of these measures are expressed in the Minority Statement, which follows Chapter IX.

REPUTATIONAL SURVEY RESULTS

In April 1981 survey forms were mailed to a total of 1,848 faculty members in biochemistry, botany, cellular/molecular biology, microbiology, physiology, and zoology. The evaluators were selected from the faculty lists furnished by the study coordinators at the 228 universities covered in the assessment. These evaluators constituted approximately 15 percent of the total faculty population--12,167 faculty members--in the biological science programs being evaluated (see Table 2.3). The survey sample was chosen on the basis of the number of faculty in a particular program and the number of doctorates awarded in the previous five years (FY1976-80)--with the stipulation that at least one evaluator was selected from every program covered in the assessment. In selecting the sample each faculty rank was represented in proportion to the total number of individuals holding that rank, and preference was given to those faculty members whom the study coordinators had nominated to serve as evaluators. As shown in Table 2.3, 1,485 individuals, 80 percent of the survey sample in the biological sciences, had been recommended by study coordinators.[10]

Each evaluator was asked to consider a stratified random sample of 50 research-doctorate programs in his or her discipline--with programs stratified by the number of faculty members associated with each program. Every program was included on 150 survey forms. The 50 programs to be evaluated appeared on each survey form in random sequence, preceded by an alphabetized list of all programs in that discipline that were being included in the study. No evaluator was asked to consider a program at his or her own institution. Ninety percent of the survey sample group were provided the names of faculty members in each of the 50 programs to be evaluated, along with data on the total number of doctorates awarded in the last five years.[11] The inclusion of this information represents a significant departure from the procedures used in earlier reputational assessments. For purposes of comparison with previous studies, 10 percent (randomly selected in each discipline) were not furnished any information other than the names of the programs.

The survey items were adapted from the form used in the Roose-Andersen study. Prior to mailing, the instrument was pretested using a small sample of faculty members in chemistry and psychology. As a result, two significant improvements were made in the original survey design. A question was added on the extent to which the evaluator was familiar with the work of the faculty in each program. Responses to this question, reported as measure 11, provide some insight into the relationship between faculty recognition and the reputational standing of a program.[12] Also added was a question on the evaluator's field of specialization--thereby making it possible to compare program evaluations in different specialty areas within a particular discipline.

A total of 1,026 faculty members in the biological sciences--56 percent of those asked to participate--completed and returned survey forms (see Table 2.3). Two factors probably have contributed to this response rate being approximately 15 percentage points below the rates reported in the Cartter and Roose-Andersen studies. First, because of the considerable expense of printing individualized survey forms (each 25-30 pages), second copies were not sent to sample members not responding to the first mailing[13]--as was done in the Cartter and Roose-Andersen efforts. Second, it is quite apparent that within the

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[10] A detailed analysis of the survey participants in each discipline is given in subsequent chapters.

[11] This information was furnished to the committee by the study coordinators at the universities participating in the study.

[12] Evidence of the strength of the relationship is provided by correlations presented in Chapters III-VIII, and an analysis of the relationship is provided in Chapter IX.

[13] A follow-up letter was sent to those not responding to the first mailing, and a second copy was distributed to those few evaluators who specifically requested another form.

TABLE 2.3 Survey Response by Discipline and Characteristics of Evaluator

	Total Program Faculty	Survey Sample		
		Total	Respondents	
	N	N	N	%
Discipline of Evaluator				
Biochemistry	2,658	417	234	56
Botany	1,589	249	153	61
Cellular/Molecular Biology	2,271	267	139	52
Microbiology	2,195	402	231	58
Physiology	1,964	303	146	48
Zoology	1,490	210	123	59
Faculty Rank				
Professor	6,188	956	510	53
Associate Professor	3,334	597	334	56
Assistant Professor	2,389	292	181	62
Other	256	3	1	33
Evaluator Selection				
Nominated by Institution	3,467	1,485	856	58
Other	8,700	363	170	47
Survey Form				
With Faculty Names	N/A*	1,662	935	56
Without Names	N/A*	186	91	49
Total All Fields	12,167	1,848	1,026	56

*Not applicable.

academic community there has been a growing dissatisfaction in recent years with educational assessments based on reputational measures. Indeed, this dissatisfaction was an important factor in the Conference Board's decision to undertake a multidimensional assessment, and some faculty members included in the sample made known to the committee their strong objections to the reputational survey.

As can be seen in Table 2.3, there is some variation in the response rates in the six biological science disciplines. Of particular interest is the relatively high rate of response from botanists and the low rate from physiologists--a result consistent with the findings in the Cartter and Roose-Andersen surveys.[14] It is not surprising to find that the evaluators nominated by study coordinators responded more often than did those who had been selected at random. No appreciable differences were found among the response rates of assistant, associate, and full professors or between the rates of those evaluators who were furnished the abbreviated survey form (without lists of program faculty) and those who were given the longer version.

Each program was considered by an average of approximately 85 survey respondents from other programs in the same discipline. The evaluators were asked to judge programs in terms of scholarly quality of program faculty, effectiveness of the program in educating research scholars/scientists, and change in program quality in the last five years.[15] The mean ratings of a program on these three survey items constitute measures 08, 09, and 10. Evaluators were also asked to indicate the extent to which they were familiar with the work of the program faculty. The average of responses to this item constitutes measure 11.

In making judgments about the quality of faculty, evaluators were instructed to consider the scholarly competence and achievements of the individuals. The ratings were furnished on the following scale:

5 Distinguished
4 Strong
3 Good
2 Adequate
1 Marginal
0 Not sufficient for doctoral education
X Don't know well enough to evaluate

In assessing the effectiveness of a program, evaluators were asked to consider the accessibility of faculty, the curricula, the instructional and research facilities, the quality of the graduate students, the performance of graduates, and other factors that contribute to a program's effectiveness. This measure was rated accordingly:

3 Extremely effective
2 Reasonably effective
1 Minimally effective
0 Not effective
X Don't know well enough to evaluate

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[14] To compare the response rates obtained in the earlier surveys, see Roose and Andersen, Table 28, p. 29.

[15] A copy of the survey instrument with its accompanying instructions is included in Appendix C.

Evaluators were instructed to assess change in program quality on the basis of whether there has been improvement in the last five years in both the scholarly quality of faculty and the effectiveness in educating research scholars/scientists. The following alternatives were provided:

2 Better than five years ago
1 Little or no change in last five years
0 Poorer than five years ago
X Don't know well enough to evaluate

Evaluators were asked to indicate their familiarity with the work of the program faculty according to the following scale:

2 Considerable familiarity
1 Some familiarity
0 Little or no familiarity

In the computation of mean ratings on measures 08, 09, and 10, the "don't know" responses were ignored. An average program rating based on fewer than 15 responses (excluding the "don't know" responses) is not reported.

Measures 08, 09, and 10 are subject to many of the same criticisms that have been directed at previous reputational surveys. Although care has been taken to improve the sampling design and to provide evaluators with some essential information about each program, the survey results merely reflect a consensus of faculty opinions. As discussed in Chapter I, these opinions may well be based on out of date information or be influenced by a variety of factors unrelated to the quality of the program. In Chapter IX a number of factors that may possibly affect the survey results are examined. In addition to these limitations, it should be pointed out that evaluators, on the average, were unfamiliar with almost half of the programs they were asked to consider.[16] As might be expected, the smaller and less prestigious programs were not as well known, and for this reason one might have less confidence in the average ratings of these programs. For all four survey measures, standard errors of the mean ratings are reported; they tend to be larger for the lesser known programs. The frequency of response to each of the survey items is discussed in Chapter IX.

Two additional comments should be made regarding the survey activity. First, it should be emphasized that the ratings derived from the survey reflect a program's standing relative to other programs in the same discipline and provide no basis for making cross-disciplinary comparisons. For example, the fact that a larger number of microbiology programs received "distinguished" ratings on measure 08 than did zoology programs indicates nothing about the relative quality of faculty in these two disciplines. It may depend, in part, on the total numbers of programs evaluated in these disciplines; in the survey instructions it was suggested to evaluators that no more than 10 percent of the programs listed be designated as "distinguished." Nor is it advisable to compare the rating of a program in one discipline with that of a program in another discipline because the ratings are based on the opinions of different groups of evaluators who were asked to judge entirely different sets of programs. Second, early in the committee's deliberations a decision was made to supplement the ratings obtained from faculty members with ratings from evaluators who hold research-oriented positions in institutions outside the academic sector. These institutions include industrial research laboratories, government research laboratories, and a variety of other research establishments. Over the past 10 years increasing numbers of doctoral recipients have taken positions outside the academic setting. The extensive involvement of these graduates in nonacademic employment is reflected in the percentages reported in Table 2.2: An average of 24 percent of the recent graduates in the biological science disciplines who had definite employment plans indicated that they planned to take positions in nonacademic settings. Data from another NRC survey suggest that the actual fraction employed outside academia may be significantly higher. The committee recognized that the inclusion of nonacademic evaluators would furnish information valuable for assessing nontraditional dimensions of doctoral education and would provide an important new measure not assessed in earlier studies. Results from a survey of this group would provide an interesting comparison with the results obtained from the survey of faculty members. A concentrated effort was made to obtain supplemental funding for adding nonacademic evaluators in selected disciplines to the survey sample, but this effort was unsuccessful. The committee nevertheless remains convinced of the importance of including evaluators from nonacademic research institutions. These institutions are likely to employ increasing numbers of graduates in many disciplines, and it is urged that this group not be overlooked in future assessments of graduate programs.

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[16] See Table 9.6 in Chapter IX.

UNIVERSITY LIBRARY SIZE

University library holdings are generally regarded as an important resource for students in graduate (and undergraduate) education. The Association of Research Libraries (ARL) has compiled data from its academic member institutions and developed a composite measure of a university library's size relative to those of other ARL members. The ARL Library Index, as it is called, is based on 10 characteristics: volumes held, volumes added (gross), microform units held, current serials received, expenditures for library materials, expenditures for binding, total salary and wage expenditures, other operating expenditures, number of professional staff, and number of nonprofessional staff.[17] The 1979-80 index, which constitutes measure 12, is available for 89 of the 228 universities included in the assessment. (These

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[17] See Appendix D for a description of the calculation of this index.

89 tend to be among the largest institutions.) The limited coverage of this measure is a major shortcoming. It should be noted that the ARL index is a composite description of library size and not a qualitative evaluation of the collections, services, or operations of the library. Also, it is a measure of aggregate size and does not take into account the library holdings in a particular department or discipline. Finally, although universities with more than one campus were instructed to include figures for the main campus only, some in fact may have reported library size for the entire university system. Whether this misreporting occurred is not known.

RESEARCH SUPPORT

Using computerized data files[18] provided by the National Science Foundation (NSF) and the National Institutes of Health (NIH), it was possible to identify which faculty members in each program had been awarded research grants during the FY1978-80 period by either of these agencies or by the Alcohol, Drug Abuse, and Mental Health Administration (ADAMHA). The fraction of faculty members in a program who had received any research grants from these agencies during this three-year period constitutes measure 13. Since these awards have been made on the basis of peer judgment, this measure is considered to reflect the perceived research competence of program faculty. However, it should be noted that significant amounts of support for research in the biological sciences come from other federal agencies as well, but it was not feasible to compile data from these other sources. It is estimated[19] that 57 percent of the university faculty members in these disciplines who received federal R&D funding obtained their support from NIH and another 24 percent from NSF. The remaining 19 percent received support from the U.S. Department of Agriculture and other federal agencies. It should be pointed out that only those faculty members who served as principal investigators or coinvestigators are counted in the computation of this measure.

Measure 14 describes the total FY1979 expenditures by a university for R&D in the biological disciplines. These data have been furnished to the NSF[20] by universities and include expenditures of funds from both federal and nonfederal sources. If an institution has more than one program being evaluated in the same discipline, the aggregate university expenditures for research in that discipline are reported for each of the programs. In each discipline data are recorded for the 100 universities with the largest R&D expenditures. Unfortunately, these data are available only for aggregate expenditures in the biological sciences and are not for expenditures in the individual biological disciplines; thus the value reported for an individual program represents the total university expenditures in the biological sciences.

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[18] A description of these files is provided in Appendix E.

[19] Based on special tabulations of data from the NRC's Survey of Doctorate Recipients, 1979.

[20] A copy of the survey instrument used to collect these data appears in Appendix E.

This measure has several other limitations related to the procedures by which the data have been collected. The committee notes that there is evidence within the source document[21] that universities use different practices for categorizing and reporting expenditures. Apparently, institutional support of research, industrial support of research, and expenditure of indirect costs are reported by different institutions in different categories (or not reported at all). Since measure 14 is based on total expenditures from all sources, the data used here are perturbed only when these types of expenditures are not subsumed under _any_ reporting category. In contrast with measure 13, measure 14 is not reported on a scale relative to the number of faculty members and thus reflects the overall level of research activity at an institution in a particular discipline. Although research grants in the sciences and engineering provide some support for graduate students as well, these measures should not be confused with measure 04, which pertains to fellowships and training grants.

PUBLICATION RECORDS

Data from the 1978 and the 1979 Science Citation Index have been compiled[22] on published articles associated with research-doctorate programs in the biological sciences. Publication counts were associated with programs on the basis of the discipline of the journal in which an article appeared and the institution with which the author was affiliated. Coauthored articles were proportionately attributed to the institutions of the individual authors. Articles appearing in multidisciplinary journals (e.g., _Science_, _Nature_) were apportioned according to the characteristic mix of subject matter in those journals. For the purposes of assigning publication counts, this mix can be estimated with reasonable accuracy.[23]

Two measures have been derived from the publication records: measure 15--the total number of articles published in the 1978-79 period that have been associated with a research-doctorate program; and measure 16--an estimation of the "influence" of these articles. The latter is a product of the number of articles attributed to a program and the estimated influence of the journals in which these articles appeared. The influence of a journal is determined from the weighted number of times, on the average, an article in that journal is cited--with references from frequently cited journals counting more heavily. A more detailed explanation of the derivation of these measures is given in Appendix F. Neither measure 15 nor measure 16 is based on actual counts of articles written only by program faculty. However, extensive analysis of the "influence" index in the fields of physics, chemistry, and biochemistry has demonstrated the stability of this index and the reliability associated with its use.[24] Of course, this does not imply that the measure captures subtle aspects of publication "influence." It is of interest to note that indices similar to measures 15 and 16 have been shown to be highly correlated with the peer ratings of graduate departments compiled in the Roose-Andersen study.[25]

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[21] National Science Foundation, _Academic Science: R and D Funds, Fiscal Year 1979_, Government Printing Office, Washington, D.C., NSF 81-301, 1981.

[22] The publication data have been generated for the committee's use by Computer Horizons, Inc., using source files provided by the Institute for Scientific Information.

[23] Francis Narin, _Evaluative Bibliometrics: The Use of Publications and Citations Analysis in the Evaluation of Scientific Activity_, Report to the National Science Foundation, March 1976, p. 203.

It must be emphasized that these measures encompass articles (published in selected journals) by *all* authors affiliated with a given university. Included therefore are articles by program faculty members, students and research personnel, and even members of other departments in that university who publish in those journals. Moreover, these measures do not take into account the differing sizes of programs, and the measures clearly do depend on faculty size. Although consideration was given to reporting the number of published articles *per faculty member*, the committee concluded that since the measure included articles by other individuals besides program faculty members, the aggregate number of articles would be a more reliable measure of overall program quality. It should be noted that if a university had more than one program being evaluated in the same discipline, it was not possible to distinguish the relative contribution of each program. In such cases the aggregate university data in that discipline were assigned to each program.

Since the data are confined to 1978-79, they do not take into account institutional mobility of authors after that period. Thus, articles by authors who have moved from one institution to another since 1979 are credited to the former institution. Also, the publication counts fail to include the contributions of faculty members' publications in journals outside their primary discipline. This point may be especially important for those programs with faculty members whose research is at the intersection of several different disciplines.

The reader should be aware of two additional caveats with regard to the interpretation of measures 15 and 16. First, both measures are based on counts of published articles and do not include books. Since in the biological sciences most scholarly contributions are published as journal articles, this may not be a serious limitation. Second, the "influence" measure should not be interpreted as an indicator of the impact of articles by individual authors. Rather it is a measure of the impact of the journals in which articles associated with a particular program have been published. Citation counts, with all their difficulties, would have been preferable since they are attributable to individual authors and they register the impact of books as well as journal articles. However, the difficulty and cost of assembling reliable counts of articles by individual authors made their use infeasible.

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[24] Narin, pp. 283-307.

[25] Richard C. Anderson, Francis Narin, and Paul McAllister, "Publication Ratings Versus Peer Ratings of Universities," *Journal of the American Society for Information Science*, March 1978, pp. 91-103; and Lyle V. Jones, "The Assessment of Scholarship," *New Directions for Program Evaluation*, No. 6, 1980, pp. 1-20.

ANALYSIS AND PRESENTATION OF THE DATA

The next six chapters present all of the information that has been compiled on individual research-doctorate programs in biochemistry, botany, cellular/molecular biology, microbiology, physiology, and zoology. Each chapter follows a similar format, designed to assist the reader in the interpretation of program data. The first table in a chapter provides a list of the programs evaluated in a discipline--including the names of the universities and departments or academic units in which programs reside--along with the full set of data compiled for individual programs. Programs are listed alphabetically according to name of institution, and both raw and standardized values are given for all but one measure.[26] For the reader's convenience an insert of information from Table 2.1 is provided that identifies each of the 16 measures reported in the table and indicates the raw scale used in reporting values for a particular measure. Standardized values, converted from raw values to have a mean of 50 and a standard deviation of 10,[27] are computed for every measure so that comparisons can easily be made of a program's relative standing on different measures. Thus, a standardized value of 30 corresponds with a raw value that is two standard deviations below the mean for that measure, and a standardized value of 70 represents a raw value two standard deviations above the mean. While the reporting of values in standardized form is convenient for comparing a particular program's standing on different measures, it may be misleading in interpreting actual differences in the values reported for two or more programs--especially when the distribution of the measure being examined is highly skewed. For example, the numbers of published articles (measure 15) associated with four biochemistry programs are reported in Table 3.1 as follows:

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[26] Since the scale used to compute measure 16--the estimated "influence" of published articles--is entirely arbitrary, only standardized values are reported for this measure.

[27] The conversion was made from the precise raw value rather than from the rounded value reported for each program. Thus, two programs may have the same reported raw value for a particular measure but different standardized values.

Program	Raw Value	Standardized Value
A	1	40
B	6	40
C	21	42
D	38	44

Although programs C and D have many times the number of articles as have programs A and B, the differences reported on a standardized scale appear to be small. Thus, the reader is urged to take note of the raw values before attempting to interpret differences in the standardized values given for two or more programs.

The initial table in each chapter also presents estimated standard errors of mean ratings derived from the four survey items (measures 08-11). A standard error is an estimated standard deviation of the sample mean rating and may be used to assess the stability of a mean rating reported for a particular program.[28] For example, one may assert (with .95 confidence) that the population mean rating would lie within two standard errors of the sample mean rating reported in this assessment.

No attempt has been made to establish a composite ranking of programs in a discipline. Indeed, the committee is convinced that no single measure adequately reflects the quality of a research-doctorate program and wishes to emphasize the importance of viewing individual programs from the perspective of multiple indices or dimensions.

The second table in each chapter presents summary statistics (i.e., number of programs evaluated, mean, standard deviation, and decile values) for each of the program measures.[29] The reader should find these statistics helpful in interpreting the data reported on individual programs. Next is a table of the intercorrelations among the various measures for that discipline. This table should be of particular interest to those desiring information about the interrelations of the various measures.

The remainder of each chapter is devoted to an examination of results from the reputational survey. Included are an analysis of the characteristics of survey participants and graphical portrayals of the relationship of the mean rating of scholarly quality of faculty (measure 08) with the number of faculty (measure 01) and the relationship of the mean rating of program effectiveness (measure 09) with the number of graduates (measure 02). A frequently mentioned criticism of the Roose-Andersen and Cartter studies is that small but distinguished programs have been penalized in the reputational ratings because they are not as highly visible as larger programs of comparable quality. The comparisons of survey ratings with measures of program size are presented as the first two figures in each chapter and provide evidence about the number of small programs in each discipline that have received high reputational ratings. Since in each case the reputational rating is more highly correlated with the square root of program size than with the size measure itself, measures 01 and 02 are plotted on a square root scale.[30] To assist the reader in interpreting results of the survey evaluations, each chapter concludes with a graphical presentation of the mean rating for every program of the scholarly quality of faculty (measure 08) and an associated "confidence interval" of 1.5 standard errors. In comparing the mean ratings of two programs, if their reported confidence intervals of 1.5 standard errors do not overlap, one may safely conclude that the program ratings are significantly different (at the .05 level of significance)--i.e., the observed difference in mean ratings is too large to be plausibly attributable to sampling error.[31]

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[28] The standard error estimate has been computed by dividing the standard deviation of a program's ratings by the square root of the number of ratings. For a more extensive discussion of this topic, see Fred N. Kerlinger, Foundations of Behavioral Research, Holt, Reinhart, and Winston, Inc., New York, 1973, Chapter 12. Readers should note that the estimate is a measure of the variation in response and by no means includes all possible sources of error.

[29] Standardized scores have been computed from precise values of the mean and standard deviation of each measure and not the rounded values reported in the second table of a chapter.

The final chapter of this report gives an overview of the evaluation process in the six biological science disciplines and includes a summary of general findings. Particular attention is given to some of the extraneous factors that may influence program ratings of individual evaluators and thereby distort the survey results. The chapter concludes with a number of specific suggestions for improving future assessments of research-doctorate programs.

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[30] For a general discussion of transforming variables to achieve linear fits, see John W. Tukey, Exploring Data Analysis, Addison-Wesley, Reading, Massachusetts, 1977.

[31] This rule for comparing nonoverlapping intervals is valid as long as the ratio of the two estimated standard errors does not exceed 2.41. (The exact statistical significance of this criterion then lies between .050 and .034.) Inspection of the standard errors reported in each discipline shows that for programs with mean ratings differing by less than 1.0 (on measure 08), the standard error of one mean very rarely exceeds twice the standard error of another.

III

Biochemistry Programs

In this chapter 139 research-doctorate programs in biochemistry are assessed. These programs, according to the information supplied by their universities, have accounted for 2,753 doctoral degrees awarded during the FY1976-80 period--approximately 89 percent of the aggregate number of biochemistry doctorates earned from U.S. universities in this five-year span.[1] Because biochemistry transcends the boundaries of many other biological science disciplines and because biochemistry programs may be found in a variety of institutional settings (including biology departments, medical school departments, agricultural school departments, etc.), the committee encountered difficulty in identifying a comprehensive set of research-doctorate programs that have produced graduates in this discipline. On the average, 25 full-time and part-time students intending to earn doctorates were enrolled in a program in December 1980, with an average faculty size of 19 members.[2] Most of the 139 programs, listed in Table 3.1, are located in biochemistry or biological chemistry departments. Approximately 10 percent are found in departments of chemistry. Fourteen programs were initiated since 1970, and each of 10 universities--Boston University, University of California (San Diego), Harvard University, University of Kansas, Ohio State University, Pennsylvania State University, University of Pittsburgh, SUNY at Buffalo, West Virginia University, and University of Wisconsin (Madison)--includes two biochemistry programs in the study. In addition to the 129 institutions represented in this discipline, another 15 were initially identified as meeting the criteria[3] for inclusion in the assessment:

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[1] Data from the NRC's Survey of Earned Doctorates indicate that 3,109 research doctorates in biochemistry were awarded by U.S. universities between FY1976 and FY1980.

[2] See the reported means for measures 03 and 01 in Table 3.2.

[3] As mentioned in Chapter I, the primary criterion for inclusion was that a university had awarded at least 5 doctorates in biochemistry during the FY1976-78 period.

University of Alabama
California Institute of Technology
Florida State University--Tallahassee
Fordham University
Medical College of Georgia
Indiana University--Bloomington
Ohio University
University of Oregon Health Sciences Center
State University of Rutgers--Newark
University of South Carolina--Columbia
Texas Tech University--Lubbock
University of Texas Health Science Center--Dallas
Tufts University
Utah State University--Logan
Washington University--Saint Louis

Three of these institutions--Medical College of Georgia, University of Oregon Health Sciences Center, and University of Texas Health Sciences Center (Dallas)--chose not to participate in the assessment in any discipline. Biochemistry programs at the other 12 institutions have not been included in the evaluations in this discipline, since in each case the study coordinator either indicated that the institution did not at that time have a research-doctorate program in biochemistry or failed to provide the information requested by the committee.

Before examining individual program results presented in Table 3.1, the reader is urged to refer to Chapter II, in which each of the 16 measures used in the assessment is discussed. Summary statistics describing every measure are given in Table 3.2. For nine of the measures, data are reported for at least 115 of the 139 biochemistry programs. For measures 04-07, which pertain to characteristics of the program graduates, data are presented for only approximately two-thirds of the programs; the other third had too few graduates on which to base statistics.* For measure 12, a composite index of the size of a university library, data are available for 88 programs; for measure 14, the total university expenditures for research in the biological sciences, data are available for 104 programs. The programs not evaluated on measures 12 and 14 are typically smaller--in terms of faculty size and graduate student enrollment--than other biochemistry programs. Were data on these two measures available for all 139 programs, it is likely that their reported means would be appreciably lower (and that some of the correlations of these measures with others would be higher). With regard to measure 10, the rated change in program quality, results were not reported for programs with fewer than 15 ratings on the survey item.

Intercorrelations among the 16 measures (Pearson product-moment coefficients) are given in Table 3.3. Of particular note are the high positive correlations of the reputational survey ratings (08, 09) with measures of publication records (15, 16) and with measure 04--the fraction of program graduates who had had national fellowship or training grant suppport. Figure 3.1 illustrates the relation between the mean rating of the scholarly quality of faculty (measure 08) and the number of faculty members (measure 01) for each of 138 programs in biochemistry. Figure 3.2 plots the mean rating of program effectiveness (measure 09) against the total number of FY1976-80 program graduates (measure 02). Although in both figures there is a significant positive correlation between program size and reputational rating, it is quite apparent that some of the smaller programs received high mean ratings and that some of the larger programs received low mean ratings.

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*As mentioned in Chapter II, data for measures 04-07 are not reported if they are based on the survey responses of fewer than 10 FY1975-79 program graduates.

Table 3.4 describes the 234 faculty members who participated in the evaluation of biochemistry programs. These individuals constituted 56 percent of those asked to respond to the survey in this discipline and 9 percent of the faculty population in the 138 research-doctorate programs being evaluated.[5] Nearly three-fourths of the survey participants had earned their highest degree prior to 1970, and half held the rank of full professor.

One exception should be noted with regard to the survey evaluations in biochemistry. In the program listing on the survey form, New Mexico State University at Las Cruces was identified as being located in Alamogordo, where there is another branch of the same university system not offering the research doctorate. Since a large majority of faculty evaluators indicated that they were unfamiliar with this program, and it is quite possible that some of them were misled by the inaccurate description of this institution, the committee has decided not to report the survey results for this program.

To assist the reader in interpreting results of the survey evaluations, estimated standard errors have been computed for mean ratings of the scholarly quality of faculty in 138 biochemistry programs (and are given in Table 3.1). For each program the mean rating and an associated "confidence interval" of 1.5 standard errors are illustrated in Figure 3.3 (listed in order of highest to lowest mean rating). In comparing two programs, if their confidence intervals do not overlap, one may conclude that there is a significant difference in their mean ratings at a .05 level of significance.[6] From this figure it is also apparent that one should have somewhat more confidence in the accuracy of the mean ratings of higher-rated programs than lower-rated programs. This generalization results primarily from the fact that evaluators are not as likely to be familiar with the less prestigious programs, and consequently the mean ratings of these programs are usually based on fewer survey responses.

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[5] See Table 2.3 in Chapter II.

[6] See pp. 31-33 for a discussion of the interpretation of mean ratings and associated confidence intervals.

TABLE 3.1 Program Measures (Raw and Standardized Values) in Biochemistry

Prog No.	University - Department/Academic Unit	Program Size			Characteristics of Program Graduates			
		(01)	(02)	(03)	(04)	(05)	(06)	(07)
001.	Alabama, University of-Birmingham	33	15	13	.56	7.5	.78	.56
	Biochemistry	*62*	*47*	*44*	*53*	*28*	*47*	*49*
002.	Albany Medical College	16	6	9	NA	NA	NA	NA
	Biochemistry	*47*	*42*	*42*				
003.	Albert Einstein College of Medicine	21	8	13	NA	NA	NA	NA
	Biochemistry	*52*	*43*	*44*				
004.	Arizona, University of-Tucson	13	21	29	.71	5.4	1.00	.88
	Biochemistry	*45*	*50*	*52*	*58*	*58*	*66*	*73*
005.	Arkansas, Univ of-Medical Sciences Campus	21	6	5	NA	NA	NA	NA
	Biochemistry	*52*	*42*	*40*				
006.	Auburn University	6	14	7	NA	NA	NA	NA
	Chemistry/Animal and Dairy Sciences	*39*	*46*	*41*				
007.	Baylor College of Medicine-Houston	13	15	26	.39	7.0	.83	.67
	Biochemistry	*45*	*47*	*50*	*47*	*35*	*52*	*57*
008.	Boston University	43	24	42	.31	6.7	.66	.52
	Interdepartmental Biochemistry Program	*71*	*52*	*58*	*44*	*39*	*37*	*47*
009.	Boston University	39	9	9	.39	5.7	.67	.50
	Medical and Dental Sciences	*67*	*44*	*42*	*47*	*54*	*38*	*45*
010.	Brandeis University	11	26	45	.93	6.2	.90	.77
	Biochemistry	*43*	*53*	*59*	*66*	*46*	*58*	*65*
011.	Brown University	16	1	1	NA	NA	NA	NA
	Biology and Medicine	*47*	*39*	*38*				
012.	Bryn Mawr College	11	12	13	.46	6.5	.73	.36
	Biology/Chemistry	*43*	*45*	*44*	*49*	*42*	*43*	*36*
013.	CUNY-Graduate School	35	32	64	.04	7.2	.89	.54
	Biochemistry	*64*	*57*	*68*	*34*	*32*	*56*	*48*
014.	California, University of-Berkeley	17	62	72	.89	5.7	.86	.66
	Biochemistry	*48*	*74*	*72*	*65*	*54*	*54*	*57*
015.	California, University of-Davis	55	45	52	.57	5.8	.71	.51
	Biochemistry	*81*	*64*	*63*	*54*	*53*	*42*	*46*
016.	California, University of-Irvine	13	7	10	NA	NA	NA	NA
	Molecular Biol and Biochem/ Biological Chem	*45*	*42*	*43*				
017.	California, University of-Los Angeles	38	45	82	.86	5.7	.79	.53
	Chemistry/Biological Chemistry	*66*	*64*	*77*	*64*	*53*	*48*	*48*
018.	California, University of-Riverside	18	35	44	.09	5.2	.91	.61
	Biochemistry	*49*	*58*	*59*	*36*	*61*	*58*	*53*
019.	California, University of-San Diego	26	32	30	.80	5.5	.93	.73
	Biology	*56*	*57*	*52*	*62*	*57*	*60*	*62*
020.	California, University of-San Diego	23	26	69	.73	5.7	.85	.62
	Chemistry	*53*	*53*	*71*	*59*	*54*	*53*	*54*

* indicates program was initiated since 1970.

NOTE: On the first line of data for every program, raw values for each measure are reported; on the second line values are reported in standardized form, with mean = 50 and standard deviation = 10. "NA" indicates that the value for a measure is not available.

TABLE 3.1 Program Measures (Raw and Standardized Values) in Biochemistry

Prog No.	Survey Results				University Library	Research Support		Published Articles		Survey Ratings Standard Error			
	(08)	(09)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(08)	(09)	(10)	(11)
001.	2.5	1.8	1.6	0.5	NA	.49	4467	90		.14	.10	.13	.07
	49	*51*	*68*	*46*		*44*	*44*	*50*	*49*				
002.	1.8	NA	NA	0.2	NA	.31	3066	16		.16	NA	NA	.05
	41			*39*		*36*	*42*	*42*	*42*				
003.	3.1	1.9	0.8	0.8	NA	.67	9184	177		.12	.08	.11	.07
	54	*53*	*36*	*52*		*52*	*51*	*59*	*63*				
004.	2.6	1.7	1.2	0.5	0.9	.92	7828	128		.11	.10	.11	.06
	50	*49*	*53*	*45*	*57*	*63*	*49*	*54*	*51*				
005.	1.4	NA	NA	0.2	NA	.24	NA	14		.23	NA	NA	.05
	37			*39*		*32*		*41*	*42*				
006.	1.2	NA	NA	0.1	NA	NA	NA	13		.20	NA	NA	.04
	35			*37*				*41*	*42*				
007.	2.8	1.7	1.2	0.8	NA	.77	14051	174		.12	.08	.12	.07
	51	*50*	*51*	*53*		*56*	*59*	*59*	*59*				
008.	2.7	1.7	1.4	0.6	-0.4	.61	NA	NA		.13	.09	.11	.08
	50	*49*	*61*	*48*	*45*	*49*			*NA*				
009.	2.5	1.4	1.1	0.5	-0.4	.51	NA	69		.13	.12	.12	.06
	48	*44*	*48*	*47*	*45*	*45*		*47*	*48*				
010.	4.2	2.5	1.1	1.6	NA	1.00	5487	85		.08	.06	.06	.06
	67	*66*	*46*	*71*		*67*	*45*	*49*	*51*				
011.	2.8	1.5	1.1	0.6	-1.1	.75	NA	44		.12	.13	.11	.07
	52	*45*	*49*	*47*	*38*	*56*		*45*	*46*				
012.	1.7	1.3	NA	0.3	NA	.00	NA	2		.29	.24	NA	.06
	40	*42*		*41*		*22*		*40*	*41*				
013.	2.7	1.8	1.1	0.4	NA	.54	NA	145		.15	.10	.11	.06
	51	*51*	*46*	*44*		*46*		*56*	*54*				
014.	4.6	2.8	1.1	1.6	2.2	1.00	18977	301		.07	.05	.08	.06
	71	*72*	*47*	*71*	*70*	*67*	*66*	*73*	*71*				
015.	3.7	2.3	1.3	1.3	0.6	.73	18053	228		.09	.07	.08	.07
	61	*63*	*57*	*65*	*55*	*54*	*65*	*65*	*59*				
016.	3.0	1.8	1.1	0.8	NA	.62	6547	80		.09	.06	.11	.07
	54	*51*	*50*	*54*		*49*	*47*	*49*	*50*				
017.	4.1	2.3	1.3	1.4	2.0	.84	15581	344		.08	.06	.07	.06
	66	*63*	*58*	*67*	*68*	*60*	*61*	*78*	*75*				
018.	2.7	1.8	1.2	0.6	-1.0	.89	6232	71		.13	.11	.14	.07
	50	*53*	*53*	*48*	*39*	*62*	*47*	*48*	*47*				
019.	3.8	2.3	1.4	1.2	-0.0	.69	8706	217		.08	.06	.08	.07
	63	*61*	*59*	*62*	*48*	*53*	*50*	*64*	*65*				
020.	4.2	2.3	1.4	1.3	-0.0	.83	8706	217		.08	.06	.08	.07
	66	*63*	*63*	*66*	*48*	*59*	*50*	*64*	*65*				

NOTE: On the first line of data for every program, raw values for each measure are reported; on the second line values are reported in standardized form, with mean = 50 and standard deviation = 10. "NA" indicates that the value for a measure is not available. Since the scale used to compute measure 16 is entirely arbitrary, only values in standardized form are reported for this measure.

TABLE 3.1 Program Measures (Raw and Standardized Values) in Biochemistry

Prog No.	University - Department/Academic Unit	Program Size (01)	(02)	(03)	Characteristics of Program Graduates (04)	(05)	(06)	(07)
021.	California, University of-San Francisco	36	22	25	.59	6.0	.82	.59
	Biochemistry	*65*	*51*	*50*	*54*	*50*	*51*	*52*
022.	California, University of-Santa Barbara	6	1	5	NA	NA	NA	NA
	*Biochemistry and Molecular Biology**	*39*	*39*	*40*				
023.	Case Western Reserve University	16	20	33	.94	6.0	.87	.47
	Biochemistry	*47*	*50*	*54*	*67*	*50*	*55*	*43*
024.	Chicago, University of	22	35	45	.80	5.5	.70	.60
	Biochemistry	*53*	*58*	*59*	*62*	*57*	*41*	*53*
025.	Cincinnati, University of	15	12	24	.17	6.3	.82	.46
	Biological Chemistry	*46*	*45*	*49*	*39*	*46*	*51*	*42*
026.	Colorado State University-Fort Collins	9	10	26	.09	5.3	.82	.64
	Biochemistry	*41*	*44*	*50*	*38*	*59*	*51*	*55*
027.	Colorado, University of	24	2	6	NA	NA	NA	NA
	Biochemistry/Biophysics/Genetics	*54*	*40*	*41*				
028.	Columbia University	21	15	21	.67	6.1	1.00	.60
	Biochemistry	*52*	*47*	*48*	*57*	*48*	*66*	*53*
029.	Connecticut, University of-Storrs	13	18	6	.25	8.7	.69	.46
	Biological Sciences	*45*	*49*	*41*	*42*	*11*	*40*	*43*
030.	Cornell University-Ithaca	34	40	51	.66	6.0	.94	.71
	Biochemistry, Molecular and Cell Biology	*63*	*61*	*62*	*57*	*50*	*61*	*61*
031.	Cornell University-Medical Center	25	23	21	.76	6.5	.91	.73
	Biochemistry	*55*	*52*	*48*	*60*	*42*	*58*	*62*
032.	Dartmouth College	10	2	17	NA	NA	NA	NA
	*Biochemistry**	*42*	*40*	*46*				
033.	Delaware, University of-Newark	8	11	24	.27	5.8	.82	.36
	Chemistry	*40*	*45*	*49*	*43*	*53*	*51*	*36*
034.	Duke University	32	40	59	.93	5.7	.91	.76
	Biochemistry	*61*	*61*	*66*	*66*	*53*	*58*	*64*
035.	Emory University	22	7	9	NA	NA	NA	NA
	Biochemistry	*53*	*42*	*42*				
036.	Florida, University of-Gainesville	20	19	21	.29	4.9	.85	.70
	Biochemistry and Molecular Biology	*51*	*49*	*48*	*43*	*65*	*53*	*60*
037.	George Washington University	12	13	21	.33	6.5	.67	.20
	Biochemistry	*44*	*46*	*48*	*45*	*42*	*38*	*24*
038.	Georgetown University	9	15	30	.25	8.2	.70	.30
	Biochemistry	*41*	*47*	*47*	*42*	*18*	*41*	*31*
039.	Georgia, University of-Athens	16	13	24	.36	6.0	.55	.55
	Biochemistry	*47*	*46*	*49*	*46*	*50*	*28*	*49*
040.	Harvard University	16	52	57	.85	6.0	.94	.65
	Biochemistry & Molecular Biology (Grad Sch)	*47*	*68*	*65*	*64*	*49*	*61*	*56*

* indicates program was initiated since 1970.

NOTE: On the first line of data for every program, raw values for each measure are reported; on the second line values are reported in standardized form, with mean = 50 and standard deviation = 10. "NA" indicates that the value for a measure is not available.

TABLE 3.1 Program Measures (Raw and Standardized Values) in Biochemistry

Prog No.	Survey Results (08)	(09)	(10)	(11)	University Library (12)	Research Support (13)	(14)	Published Articles (15)	(16)	Survey Ratings Standard Error (08)	(09)	(10)	(11)
021.	4.4	2.4	1.7	1.5	NA	.83	13194	369		.08	.07	.08	.06
	69	*64*	*74*	*71*		*59*	*57*	*81*	*78*				
022.	3.0	1.5	1.0	0.8	-0.1	NA	NA	53		.14	.14	.10	.08
	54	*46*	*41*	*54*	*47*			*46*	*47*				
023.	3.2	2.1	0.9	0.9	-1.3	.81	7721	6		.09	.06	.10	.07
	56	*58*	*39*	*56*	*35*	*58*	*49*	*40*	*42*				
024.	3.9	2.3	1.2	1.3	0.9	.86	17589	229		.07	.06	.08	.07
	64	*62*	*51*	*65*	*57*	*61*	*64*	*65*	*67*				
025.	2.4	1.8	1.4	0.6	-0.2	.80	9365	65		.14	.08	.10	.07
	48	*52*	*63*	*48*	*46*	*58*	*51*	*47*	*47*				
026.	2.1	1.5	1.2	0.4	-1.1	NA	8863	53		.13	.13	.14	.07
	44	*44*	*51*	*45*	*37*		*51*	*46*	*46*				
027.	2.9	1.6	1.5	0.8	-0.9	.71	11967	123		.11	.09	.12	.07
	53	*48*	*65*	*53*	*40*	*54*	*55*	*53*	*54*				
028.	3.9	2.1	1.2	1.2	1.7	.86	11090	176		.08	.07	.10	.07
	64	*59*	*52*	*64*	*66*	*60*	*54*	*59*	*59*				
029.	2.6	1.6	0.9	0.7	-0.5	.77	15199	39		.13	.12	.11	.07
	50	*47*	*40*	*50*	*44*	*56*	*60*	*44*	*44*				
030.	4.3	2.5	1.4	1.5	1.6	.74	14597	272		.07	.06	.07	.06
	67	*66*	*59*	*71*	*64*	*55*	*60*	*70*	*66*				
031.	3.6	2.2	1.0	1.0	NA	.24	14597	76		.10	.07	.09	.07
	60	*59*	*42*	*58*		*32*	*60*	*48*	*51*				
032.	2.4	1.4	0.9	0.5	-1.1	.90	4419	34		.16	.16	.15	.07
	47	*44*	*37*	*46*	*37*	*62*	*44*	*44*	*44*				
033.	2.5	1.7	1.5	0.6	NA	NA	NA	35		.11	.13	.13	.08
	48	*49*	*64*	*50*				*44*	*44*				
034.	3.9	2.4	1.3	1.2	0.3	.75	11320	180		.11	.08	.09	.08
	63	*64*	*57*	*63*	*52*	*56*	*54*	*60*	*62*				
035.	2.1	1.2	1.2	0.5	-0.6	.41	2874	47		.15	.13	.16	.07
	45	*40*	*52*	*46*	*42*	*40*	*41*	*45*	*45*				
036.	2.4	1.7	1.4	0.5	0.8	.60	3486	63		.13	.10	.12	.06
	48	*50*	*59*	*47*	*56*	*49*	*42*	*47*	*47*				
037.	2.3	1.5	1.0	0.4	NA	.50	2641	21		.16	.11	.17	.06
	47	*46*	*43*	*44*		*44*	*41*	*42*	*43*				
038.	2.0	1.4	1.0	0.4	-0.6	NA	4200	38		.16	.14	.13	.06
	43	*43*	*43*	*44*	*42*		*43*	*44*	*44*				
039.	2.5	1.7	1.1	0.5	0.4	.88	10714	109		.15	.13	.07	09
	48	*50*	*48*	*47*	*53*	*61*	*54*	*52*	*49*				
040.	4.9	2.7	1.1	1.8	3.0	1.00	34979	224		.04	.06	.06	.05
	74	*71*	*50*	*76*	*78*	*67*	*91*	*65*	*67*				

NOTE: On the first line of data for every program, raw values for each measure are reported; on the second line values are reported in standardized form, with mean = 50 and standard deviation = 10. "NA" indicates that the value for a measure is not available. Since the scale used to compute measure 16 is entirely arbitrary, only values in standardized form are reported for this measure.

TABLE 3.1 Program Measures (Raw and Standardized Values) in Biochemistry

Prog No.	University - Department/Academic Unit	Program Size (01)	(02)	(03)	Characteristics of Program Graduates (04)	(05)	(06)	(07)
041.	Harvard University	28	22	21	.95	5.7	.83	.72
	Biological Chemistry (Medical School)	*58*	*51*	*48*	*67*	*54*	*52*	*61*
042.	Hawaii, University of	13	16	29	.25	6.8	.50	.33
	Biochemistry and Biophysics	*45*	*48*	*52*	*42*	*39*	*24*	*33*
043.	Health Sciences, Univ of/Chicago Med School	11	3	4	NA	NA	NA	NA
	*Biochemistry**	*43*	*40*	*40*				
044.	Houston, University of	17	20	23	.31	5.5	.69	.63
	Biophysical Sciences	*48*	*50*	*49*	*44*	*57*	*40*	*54*
045.	Howard University	7	4	NA	NA	NA	NA	NA
	*Biochemistry**	*39*	*41*					
046.	Illinois Institute of Technology	10	19	14	.44	6.3	.56	.50
	Biology	*42*	*49*	*45*	*49*	*46*	*30*	*45*
047.	Illinois, University of-Medical Center	18	25	26	.11	6.2	.93	.48
	Biological Chemistry	*49*	*53*	*50*	*37*	*47*	*60*	*44*
048.	Illinois, University-Urbana/Champaign	17	40	83	.92	5.9	.83	.61
	Biochemistry	*48*	*61*	*77*	*66*	*52*	*52*	*53*
049.	Indiana University-Purdue University	18	15	18	.27	6.8	.73	.40
	Biochemistry	*49*	*47*	*47*	*43*	*39*	*44*	*38*
050.	Iowa State University-Ames	20	24	37	.10	5.8	.80	.55
	Biochemistry and Biophysics	*51*	*52*	*56*	*37*	*52*	*49*	*49*
051.	Iowa, University of-Iowa City	23	21	36	.63	5.0	.87	.52
	Biochemistry	*53*	*50*	*55*	*55*	*64*	*55*	*47*
052.	Johns Hopkins University	13	120	28	.93	6.0	.96	.64
	Biochemistry	*45*	*99*	*51*	*67*	*50*	*62*	*56*
053.	Kansas State University-Manhattan	13	7	13	NA	NA	NA	NA
	Biochemistry	*45*	*42*	*44*				
054.	Kansas, University of	13	16	20	.38	5.8	.88	.56
	Biochemistry (Graduate School)	*45*	*48*	*47*	*46*	*52*	*55*	*50*
055.	Kansas, University of	19	17	14	.07	6.0	.50	.43
	Biochemistry (Schl of Medicine-Kansas City)	*50*	*48*	*45*	*35*	*50*	*24*	*40*
056.	Kentucky, University of	12	8	12	NA	NA	NA	NA
	Biochemistry	*44*	*43*	*44*				
057.	Loma Linda University	9	NA	7	NA	NA	NA	NA
	Biochemistry	*41*		*41*				
058.	Louisiana State University-Baton Rouge	9	9	13	NA	NA	NA	NA
	Biochemistry	*41*	*44*	*44*				
059.	Louisville, University of	16	8	22	NA	NA	NA	NA
	Biochemistry	*47*	*43*	*48*				
060.	Loyola University of Chicago	12	12	27	NA	NA	NA	NA
	Biochemistry and Biophysics	*44*	*45*	*51*				

* indicates program was initiated since 1970.

NOTE: On the first line of data for every program, raw values for each measure are reported; on the second line values are reported in standardized form, with mean = 50 and standard deviation = 10. "NA" indicates that the value for a measure is not available.

TABLE 3.1 Program Measures (Raw and Standardized Values) in Biochemistry

Prog No.	Survey Results				University Library	Research Support		Published Articles		Survey Ratings Standard Error			
	(08)	(09)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(08)	(09)	(10)	(11)
041.	4.4	2.5	1.0	1.4	3.0	.39	34979	424		.09	.07	.07	.06
	69	*67*	*45*	*68*	*78*	*39*	*91*	*87*	*90*				
042.	2.2	1.5	1.1	0.5	-0.1	.54	4440	20		.14	.10	.09	.07
	46	*45*	*49*	*47*	*47*	*46*	*44*	*42*	*43*				
043.	2.0	0.9	NA	0.3	NA	.36	NA	7		.12	.17	NA	.06
	43	*34*		*41*		*38*		*41*	*42*				
044.	2.0	NA	NA	0.2	-0.9	.59	NA	27		.17	NA	NA	.04
	43			*38*	*40*	*48*		*43*	*43*				
045.	1.1	0.6	NA	0.2	-0.4	NA	NA	16		.16	.13	NA	.05
	34	*27*		*39*	*44*			*42*	*42*				
046.	1.6	1.2	NA	0.1	NA	.40	NA	13		.21	.16	NA	.04
	39	*39*		*38*		*40*		*41*	*42*				
047.	2.5	1.6	0.9	0.5	NA	.50	4393	170		.14	.11	.16	.06
	48	*48*	*41*	*46*		*44*	*44*	*59*	*56*				
048.	3.8	2.4	1.2	1.2	2.0	.88	6074	150		.09	.08	.08	.07
	62	*64*	*54*	*63*	*68*	*61*	*46*	*56*	*53*				
049.	2.5	1.7	1.0	0.4	NA	.72	2940	NA		.14	.09	.08	.07
	49	*51*	*41*	*44*		*54*	*42*		*NA*				
050.	2.9	1.9	1.0	0.9	-0.5	.50	5287	56		.11	.10	.08	.08
	53	*54*	*42*	*56*	*43*	*44*	*45*	*46*	*45*				
051.	3.5	2.0	1.4	1.0	0.3	.74	7088	91		.07	.07	.08	.06
	59	*56*	*63*	*58*	*51*	*55*	*48*	*50*	*48*				
052.	3.4	2.2	1.1	0.9	-0.4	.69	19837	223		.10	.08	.09	.08
	58	*61*	*49*	*56*	*45*	*53*	*68*	*65*	*66*				
053.	2.0	1.4	1.2	0.4	NA	.39	2496	38		.14	.14	.15	.06
	43	*43*	*50*	*44*		*39*	*41*	*44*	*44*				
054.	2.0	1.6	1.1	0.3	0.1	.54	3161	26		.16	.10	.10	.06
	44	*48*	*46*	*42*	*49*	*46*	*42*	*43*	*43*				
055.	2.5	1.7	1.2	0.7	0.1	.68	3161	62		.11	.09	.12	.07
	48	*49*	*54*	*50*	*49*	*53*	*42*	*47*	*47*				
056.	2.2	1.4	1.0	0.6	-0.1	.67	484	33		.14	.11	.11	.07
	46	*43*	*41*	*48*	*48*	*52*	*38*	*43*	*44*				
057.	0.7	NA	NA	0.1	NA	NA	NA	1		.18	NA	NA	.04
	30			*37*				*40*	*41*				
058.	1.5	1.0	NA	0.2	-0.3	NA	5116	23		.21	.17	NA	.06
	38	*35*		*40*	*45*		*45*	*42*	*42*				
059.	1.8	1.2	1.2	0.4	NA	.25	NA	32		.15	.12	.20	.06
	41	*40*	*52*	*43*		*33*		*43*	*44*				
060.	1.4	1.0	NA	0.2	NA	.00	NA	15		.16	.14	NA	.05
	36	*35*		*39*		*22*		*41*	*42*				

NOTE: On the first line of data for every program, raw values for each measure are reported; on the second line values are reported in standardized form, with mean = 50 and standard deviation = 10. "NA" indicates that the value for a measure is not available. Since the scale used to compute measure 16 is entirely arbitrary, only values in standardized form are reported for this measure.

TABLE 3.1 Program Measures (Raw and Standardized Values) in Biochemistry

Prog No.	University - Department/Academic Unit	Program Size			Characteristics of Program Graduates			
		(01)	(02)	(03)	(04)	(05)	(06)	(07)
061.	Maryland, University of-Baltimore Prof Schl	16	NA	3	NA	NA	NA	NA
	*Biological Chemistry**	*47*		*39*				
062.	Maryland, University of-College Park	11	7	19	.40	6.5	NA	NA
	*Chemistry**	*43*	*42*	*47*	*47*	*42*		
063.	Massachusetts Institute of Technology	24	35	43	.73	5.5	.88	.61
	Biology	*54*	*58*	*58*	*59*	*57*	*56*	*53*
064.	Massachusetts, University of-Amherst	8	15	25	.33	5.9	.73	.33
	Biochemistry	*40*	*47*	*50*	*45*	*51*	*44*	*33*
065.	Medical University of South Carolina	25	15	11	.10	7.5	.90	.60
	Biochemistry	*55*	*47*	*43*	*37*	*28*	*58*	*53*
066.	Miami, University of-Florida	25	25	18	.63	5.8	.65	.46
	Biochemistry	*55*	*53*	*47*	*56*	*52*	*37*	*43*
067.	Michigan State University-East Lansing	37	34	69	.60	5.2	.90	.63
	Biochemistry	*66*	*58*	*71*	*55*	*61*	*58*	*54*
068.	Michigan, University of-Ann Arbor	51	53	60	.88	5.6	.88	.67
	Biological Chemistry	*78*	*69*	*66*	*64*	*56*	*55*	*57*
069.	Minnesota, University of	41	49	50	.67	6.2	.73	.56
	Biochemistry (Graduate Schl & Medical Schl)	*69*	*66*	*62*	*57*	*47*	*44*	*49*
070.	Missouri, University of-Columbia	23	18	12	.25	5.4	.90	.65
	Biochemistry	*53*	*49*	*44*	*42*	*58*	*58*	*56*
071.	Nebraska, University of-Lincoln	16	16	35	.21	7.5	.72	.22
	Chemistry/School of Life Sciences	*47*	*48*	*55*	*41*	*28*	*43*	*25*
072.	New Hampshire, University of	6	10	6	.20	NA	.90	.60
	Biochemistry	*39*	*44*	*41*	*40*		*58*	*53*
073.	New Jersey, College of Medicine & Dentistry	14	8	13	NA	NA	NA	NA
	*Biochemistry**	*46*	*43*	*44*				
074.	New Mexico State University-Las Cruces	7	10	14	NA	NA	NA	NA
	Chemistry	*39*	*44*	*45*				
075.	New York University	25	14	26	.75	7.0	.75	.58
	Basic Medical Sciences	*55*	*46*	*50*	*60*	*35*	*45*	*51*
076.	North Carolina State University-Raleigh	12	16	25	.22	5.9	.88	.53
	Biochemistry	*44*	*48*	*50*	*41*	*51*	*56*	*48*
077.	North Carolina, University of-Chapel Hill	33	39	57	.35	5.3	.88	.52
	Biochemistry and Nutrition	*62*	*61*	*65*	*46*	*59*	*56*	*47*
078.	North Dakota State University-Fargo	11	9	9	.27	4.8	.82	.55
	Biochemistry	*43*	*44*	*42*	*43*	*66*	*51*	*49*
079.	North Dakota, University of-Grand Forks	6	9	7	NA	NA	NA	NA
	Biochemistry	*39*	*44*	*41*				
080.	Northern Illinois University-De Kalb	5	2	10	NA	NA	NA	NA
	Chemistry	*38*	*40*	*43*				

* indicates program was initiated since 1970.

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TABLE 3.1 Program Measures (Raw and Standardized Values) in Biochemistry

Prog No.	Survey Results				University Library	Research Support		Published Articles		Survey Ratings Standard Error			
	(08)	(09)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(08)	(09)	(10)	(11)
061.	2.2	1.5	1.3	0.5	NA	.63	6061	65		.13	.13	.16	.06
	45	45	56	46		50	46	47	47				
062.	1.8	NA	NA	0.2	0.2	.36	1623	27		.28	NA	NA	.04
	42			39	50	38	39	43	42				
063.	5.0	2.9	1.3	1.7	-0.3	.92	17348	300		.03	.04	.07	.06
	74	74	57	74	45	63	64	73	73				
064.	2.4	1.7	1.2	0.5	-0.7	NA	3022	64		.13	.09	.10	.06
	48	49	54	47	41		42	47	47				
065.	2.0	1.5	NA	0.3	NA	.52	3178	29		.20	.17	NA	.06
	43	45		41		45	42	43	43				
066.	2.7	1.7	1.2	0.8	NA	.64	6101	73		.12	.08	.09	.07
	51	50	51	54		51	46	48	48				
067.	3.3	2.1	1.2	0.9	0.3	.62	10357	153		.09	.06	.10	.07
	57	58	53	56	52	50	53	57	53				
068.	3.7	2.3	1.1	1.3	1.8	.67	15431	126		.09	.06	.07	.07
	62	63	49	65	66	52	61	54	55				
069.	3.4	2.1	1.4	1.1	1.2	.66	13696	250		.09	.05	.08	.07
	58	58	60	60	60	51	58	68	63				
070.	2.5	1.5	1.1	0.5	-0.2	.70	4628	NA		.13	.12	.14	.07
	48	45	48	47	46	53	44		NA				
071.	1.7	1.4	1.2	0.3	-0.5	.50	2965	47		.13	.11	.14	.06
	40	43	52	42	43	44	42	45	44				
072.	1.0	NA	NA	0.1	NA	NA	NA	4		.20	NA	NA	.03
	32			37				40	41				
073.	1.6	1.1	NA	0.3	NA	.43	4529	80		.17	.14	NA	.05
	39	36		40		41	44	49	46				
074.	NA	NA	NA	NA	NA	NA	NA	18		NA	NA	NA	NA
								42	43				
075.	3.4	1.9	0.7	0.8	0.5	.52	9934	117		.09	.06	.11	.06
	58	53	31	53	53	45	52	53	51				
076.	2.2	1.4	1.0	0.5	NA	.50	6741	38		.16	.12	.14	.07
	45	43	43	45		44	47	44	44				
077.	3.2	2.0	1.5	1.0	1.0	.64	9849	94		.09	.08	.09	.08
	56	56	65	57	58	50	52	50	51				
078.	1.0	NA	NA	0.2	NA	.09	5698	8		.15	NA	NA	.04
	33			38		26	46	41	41				
079.	1.7	NA	NA	0.5	NA	NA	NA	8		.19	NA	NA	.07
	41			45				41	41				
080.	1.1	0.8	NA	0.3	NA	NA	NA	15		.15	.17	NA	.06
	34	30		41				41	42				

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TABLE 3.1 Program Measures (Raw and Standardized Values) in Biochemistry

Prog No.	University - Department/Academic Unit	Program Size			Characteristics of Program Graduates			
		(01)	(02)	(03)	(04)	(05)	(06)	(07)
081.	Northwestern University	26	42	28	.62	5.3	.94	.75
	Biochemistry and Molecular Biology/ Biochem	*56*	*62*	*51*	*55*	*59*	*61*	*63*
082.	Notre Dame, University of	5	14	15	.00	5.3	1.00	.75
	Chemistry	*38*	*46*	*45*	*33*	*60*	*66*	*63*
083.	Ohio State University-Columbus	16	25	34	.15	5.3	.79	.53
	Biochemistry	*47*	*53*	*54*	*38*	*60*	*48*	*47*
084.	Ohio State University-Columbus	19	23	18	.26	5.8	.56	.28
	Physiological Chemistry	*50*	*52*	*47*	*42*	*53*	*29*	*29*
085.	Oklahoma State University-Stillwater	15	27	13	.25	4.9	.81	.57
	Biochemistry	*46*	*54*	*44*	*42*	*65*	*50*	*51*
086.	Oklahoma, University of-Norman	25	21	30	.36	6.0	.69	.31
	Biochemistry and Molecular Biology	*55*	*50*	*52*	*46*	*50*	*40*	*32*
087.	Oregon State University-Corvallis	25	20	30	.33	5.8	.90	.53
	Biochemistry and Biophysics	*55*	*50*	*52*	*45*	*53*	*57*	*47*
088.	Oregon, University of-Eugene	13	9	2	.84	5.9	.84	.68
	Biology/Chemistry	*45*	*44*	*39*	*63*	*51*	*53*	*59*
089.	Pennsylvania State University	14	22	25	.09	5.2	.73	.64
	Biochemistry (Graduate School)	*46*	*51*	*50*	*36*	*61*	*43*	*55*
090.	Pennsylvania State University	10	13	16	NA	NA	NA	NA
	Biological Chemistry (Medical Center)	*42*	*46*	*46*				
091.	Pennsylvania, University of	60	27	27	.76	6.3	.72	.56
	Biochemistry	*86*	*54*	*51*	*60*	*45*	*43*	*50*
092.	Pittsburgh, University of	9	10	18	NA	NA	NA	NA
	Biochemistry (School of Medicine)	*41*	*44*	*47*				
093.	Pittsburgh, University of	27	11	12	.40	6.0	.40	.20
	*Biological Sciences (Arts and Sciences)**	*57*	*45*	*44*	*47*	*50*	*16*	*24*
094.	Princeton University	17	26	31	.82	5.9	.89	.63
	Biochemical Sciences	*48*	*53*	*53*	*62*	*51*	*57*	*55*
095.	Purdue University-West Lafayette	18	37	52	.51	5.4	.88	.61
	Biological Sciences	*49*	*60*	*63*	*51*	*58*	*56*	*53*
096.	Rhode Island, University of	6	9	6	.36	6.5	.79	.29
	Biochemistry/Biophysics	*39*	*44*	*41*	*46*	*42*	*48*	*30*
097.	Rice University	11	19	36	.27	4.6	.93	.73
	Biochemistry	*43*	*49*	*55*	*43*	*70*	*60*	*62*
098.	Rochester, University of	19	30	23	.70	6.0	1.00	.75
	Biochemistry	*50*	*56*	*49*	*58*	*50*	*66*	*63*
099.	Rockefeller University	38	17	12	.40	5.9	.78	.50
	Biochemistry	*66*	*48*	*44*	*47*	*51*	*47*	*45*
100.	Rutgers, The State University-New Brunswick	51	34	94	.27	5.7	.73	.57
	Biochemistry	*78*	*58*	*83*	*43*	*54*	*44*	*50*

* indicates program was initiated since 1970.

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TABLE 3.1 Program Measures (Raw and Standardized Values) in Biochemistry

Prog No.	Survey Results (08)	(09)	(10)	(11)	University Library (12)	Research Support (13)	(14)	Published Articles (15)	(16)	Survey Ratings Standard Error (08)	(09)	(10)	(11)
081.	3.7	2.1	1.1	1.2	0.3	.96	4760	126		.10	.08	.10	.06
	61	*58*	*48*	*62*	*51*	*65*	*44*	*54*	*53*				
082.	1.7	1.1	NA	0.4	-1.3	NA	NA	33		.19	.19	NA	.07
	40	*38*		*43*	*35*			*43*	*45*				
083.	2.5	1.5	0.9	0.6	0.9	.63	8330	62		.13	.09	.09	.06
	48	*45*	*39*	*48*	*57*	*50*	*50*	*47*	*46*				
084.	2.3	1.4	0.8	0.4	0.9	.58	8330	51		.16	.12	.10	.07
	46	*44*	*34*	*43*	*57*	*48*	*50*	*45*	*45*				
085.	2.3	1.6	1.0	0.4	-1.9	.40	3127	24		.13	.10	.09	.07
	47	*48*	*41*	*44*	*29*	*40*	*42*	*42*	*43*				
086.	2.3	1.6	1.1	0.5	-0.6	.16	NA	27		.12	.09	.12	.07
	46	*48*	*46*	*47*	*43*	*29*		*43*	*43*				
087.	3.1	2.0	1.4	0.9	NA	.88	7108	79		.11	.06	.09	.08
	55	*57*	*60*	*55*		*61*	*48*	*49*	*47*				
088.	3.3	2.1	1.1	0.8	-0.9	.77	NA	70		.10	.08	.07	.07
	57	*58*	*46*	*53*	*39*	*56*		*48*	*48*				
089.	2.7	1.9	1.2	0.6	0.7	.57	8024	89		.11	.07	.09	.08
	50	*54*	*52*	*48*	*55*	*47*	*49*	*50*	*47*				
090.	2.1	1.4	1.1	0.4	0.7	.80	8024	81		.16	.11	.17	.06
	45	*43*	*46*	*43*	*55*	*58*	*49*	*49*	*51*				
091.	4.0	2.2	1.2	1.4	0.7	.65	23550	302		.08	.07	.07	.07
	65	*60*	*50*	*68*	*55*	*51*	*73*	*73*	*69*				
092.	2.3	1.5	0.6	0.5	0.1	NA	6462	67		.14	.13	.14	.07
	46	*45*	*27*	*46*	*49*		*47*	*47*	*47*				
093.	2.8	1.8	1.0	0.6	0.1	.78	6462	51		.11	.10	.13	.07
	52	*51*	*45*	*49*	*49*	*57*	*47*	*45*	*46*				
094.	3.5	2.0	0.6	1.0	0.9	.82	3574	66		.09	.07	.11	.08
	59	*57*	*25*	*59*	*57*	*59*	*43*	*47*	*48*				
095.	3.3	2.0	1.2	1.0	-0.5	.89	10337	204		.09	.05	.10	.07
	57	*56*	*51*	*58*	*43*	*62*	*53*	*62*	*60*				
096.	1.4	1.1	NA	0.2	NA	NA	NA	34		.17	.19	NA	.05
	37	*36*		*39*				*44*	*43*				
097.	3.1	2.0	1.5	0.8	-1.4	.73	NA	45		.10	.08	.09	.07
	55	*55*	*65*	*54*	*34*	*54*		*45*	*46*				
098.	2.5	1.6	1.2	0.5	-0.6	.84	15969	106		.11	.09	.11	.06
	48	*48*	*53*	*47*	*42*	*60*	*62*	*52*	*50*				
099.	4.6	2.5	1.0	1.6	NA	.76	27299	194		.06	.07	.07	.06
	71	*66*	*44*	*72*		*56*	*79*	*61*	*65*				
100.	3.2	1.9	1.3	0.7	0.8	.33	7505	71		.12	.08	.08	.07
	56	*54*	*57*	*50*	*56*	*37*	*49*	*48*	*46*				

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TABLE 3.1 Program Measures (Raw and Standardized Values) in Biochemistry

Prog No.	University - Department/Academic Unit	Program Size (01)	(02)	(03)	Characteristics of Program Graduates (04)	(05)	(06)	(07)
101.	SUNY Upstate Medical Center	11	10	12	NA	NA	NA	NA
	Biochemistry	*43*	*44*	*44*				
102.	SUNY at Albany	6	NA	NA	.15	6.0	.75	.58
	Biological Sciences	*39*			*38*	*50*	*45*	*51*
103.	SUNY at Buffalo	13	8	6	NA	NA	NA	NA
	Biochemistry (Roswell Park Graduate Div)	*45*	*43*	*41*				
104.	SUNY at Buffalo	25	36	30	.27	6.6	.77	.68
	Biochemistry (School of Medicine)	*55*	*59*	*52*	*43*	*40*	*47*	*59*
105.	SUNY at Stony Brook	26	15	48	.24	6.6	.87	.67
	*Biochemistry**	*56*	*47*	*61*	*41*	*41*	*55*	*57*
106.	SUNY-College of Environ Science & Forestry	4	1	6	NA	NA	NA	NA
	*School of Biology, Chemistry & Ecology**	*37*	*39*	*41*				
107.	SUNY-Downstate Medical Center	17	10	14	NA	NA	NA	NA
	Biochemistry	*48*	*44*	*45*				
108.	Saint Louis University	19	20	24	.94	5.5	.88	.56
	Biochemistry	*50*	*50*	*49*	*67*	*57*	*55*	*50*
109.	South Dakota, University of-Vermillion	14	8	6	NA	NA	NA	NA
	Biochem, Physiology, and Pharmacology	*46*	*43*	*41*				
110.	Southern California, University of	18	14	15	.57	5.7	1.00	.62
	Biochemistry	*49*	*46*	*45*	*54*	*54*	*66*	*54*
111.	Southern Illinois University-Carbondale	7	9	13	NA	NA	NA	NA
	Chemistry and Biochemistry	*39*	*44*	*44*				
112.	Stanford University	27	47	27	.95	5.7	.95	.67
	Biochemistry	*57*	*65*	*51*	*67*	*54*	*62*	*57*
113.	Syracuse University	6	21	10	.33	5.2	.83	.67
	*Biology**	*39*	*50*	*43*	*45*	*61*	*52*	*57*
114.	Temple University	18	11	11	NA	NA	NA	NA
	Biochemistry	*49*	*45*	*43*				
115.	Tennessee, Univ of-Ctr for Health Sciences	36	20	20	.30	7.2	.83	.58
	Biochemistry	*65*	*50*	*47*	*44*	*33*	*52*	*51*
116.	Tennessee, University of-Knoxville	8	14	9	.59	5.8	1.00	.82
	Biochemistry	*40*	*46*	*42*	*54*	*53*	*66*	*69*
117.	Texas A & M University	23	26	22	.12	6.0	.73	.35
	Biochemistry and Biophysics	*53*	*53*	*48*	*37*	*50*	*44*	*34*
118.	Texas, U of-Health Science Center, Houston	49	20	29	.35	5.2	.74	.63
	Biochem & Molecular Biology/Biochemistry	*76*	*50*	*52*	*46*	*62*	*44*	*55*
119.	Texas, University of-Austin	10	18	45	.23	6.3	.77	.55
	Chemistry	*42*	*49*	*59*	*41*	*46*	*47*	*49*
120.	Texas, U of-Health Science Ctr, San Antonio	23	9	18	NA	NA	NA	NA
	*Biochemistry**	*53*	*44*	*47*				

* indicates program was initiated since 1970.

NOTE: On the first line of data for every program, raw values for each measure are reported; on the second line values are reported in standardized form, with mean = 50 and standard deviation = 10. "NA" indicates that the value for a measure is not available.

TABLE 3.1 Program Measures (Raw and Standardized Values) in Biochemistry

Prog No.	Survey Results				University Library	Research Support		Published Articles		Survey Ratings Standard Error			
	(08)	(09)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(08)	(09)	(10)	(11)
101.	1.9	1.2	NA	0.3	NA	.55	NA	34		.14	.12	NA	.06
	43	*39*		*41*		*46*		*44*	*44*				
102.	2.0	0.9	0.7	0.5	-1.0	NA	NA	56		.14	.19	.21	.07
	43	*34*	*31*	*45*	*39*			*46*	*47*				
103.	2.5	1.4	1.0	0.4	0.3	.00	6799	40		.18	.13	.10	.05
	48	*44*	*43*	*43*	*51*	*22*	*47*	*44*	*44*				
104.	2.5	1.6	1.3	0.5	0.3	.48	6799	61		.12	.11	.14	.07
	48	*48*	*55*	*46*	*51*	*43*	*47*	*47*	*45*				
105.	3.0	2.0	1.4	0.9	-0.6	.77	5802	104		.12	.07	.09	.08
	54	*55*	*63*	*56*	*42*	*56*	*46*	*51*	*53*				
106.	0.7	0.7	NA	0.1	NA	NA	NA	7		.18	.21	NA	.04
	30	*29*		*38*				*41*	*42*				
107.	2.0	1.2	0.8	0.4	NA	.53	3077	59		.18	.19	.14	.07
	43	*38*	*32*	*43*		*46*	*42*	*46*	*45*				
108.	2.8	1.7	1.0	0.8	NA	.63	3674	67		.13	.08	.11	.08
	51	*51*		*52*		*50*	*43*	*47*	*47*				
109.	1.3	1.0	NA	0.3	NA	.50	NA	7		.16	.13	NA	.05
	36	*34*		*40*		*44*		*41*	*42*				
110.	3.0	1.8	1.1	0.8	0.4	.89	2405	80		.10	.09	.10	.07
	54	*51*	*49*	*54*	*52*	*62*	*41*	*49*	*47*				
111.	1.6	1.1	1.2	0.3	-0.2	NA	NA	2		.19	.17	.14	.05
	39	*37*	*52*	*41*	*46*			*40*	*41*				
112.	4.9	2.8	1.4	1.7	2.0	.85	12514	290		.03	.05	.06	.05
	74	*73*	*60*	*76*	*68*	*60*	*56*	*72*	*78*				
113.	1.8	1.3	0.8	0.4	-0.3	NA	NA	29		.16	.13	.14	.06
	41	*42*	*36*	*44*	*45*			*43*	*43*				
114.	2.9	1.8	1.1	0.7	-0.4	.67	6914	77		.11	.09	.12	.07
	53	*51*	*48*	*52*	*44*	*52*	*48*	*48*	*50*				
115.	2.5	1.6	1.1	0.4	NA	.31	2127	59		.13	.10	.10	.05
	49	*48*	*50*	*43*		*35*	*40*	*46*	*46*				
116.	1.6	1.4	0.9	0.3	-0.4	NA	NA	26		.17	.12	.15	.06
	39	*43*	*40*	*41*	*44*			*43*	*43*				
117.	2.2	NA	NA	0.3	-0.5	.39	3199	70		.16	NA	NA	.06
	45			*42*	*44*	*39*	*42*	*48*	*45*				
118.	2.9	1.8	1.6	0.7	NA	.53	4151	NA		.13	.08	.10	.07
	53	*52*	*71*	*50*		*46*	*43*		*NA*				
119.	3.0	1.9	0.9	0.8	1.6	.70	5757	98		.11	.08	.10	.08
	54	*55*	*37*	*53*	*64*	*53*	*46*	*51*	*50*				
120.	2.7	1.7	1.7	0.5	NA	.70	6064	NA		.14	.12	.09	.06
	50	*49*	*77*	*46*		*53*	*46*		*NA*				

NOTE: On the first line of data for every program, raw values for each measure are reported; on the second line values are reported in standardized form, with mean = 50 and standard deviation = 10. "NA" indicates that the value for a measure is not available. Since the scale used to compute measure 16 is entirely arbitrary, only values in standardized form are reported for this measure.

TABLE 3.1 Program Measures (Raw and Standardized Values) in Biochemistry

Prog No.	University - Department/Academic Unit	Program Size (01)	(02)	(03)	Characteristics of Program Graduates (04)	(05)	(06)	(07)
121.	Texas, University of-Med Branch, Galveston	21	8	17	NA	NA	NA	NA
	*Human Biological Chemistry & Genetics**	*52*	*43*	*46*				
122.	Thomas Jefferson University	14	5	7	NA	NA	NA	NA
	Biochemistry	*46*	*41*	*41*				
123.	Tulane University	12	4	10	NA	NA	NA	NA
	Biochemistry	*44*	*41*	*43*				
124.	Utah, University of-Salt Lake City	14	8	8	NA	NA	NA	NA
	Biochemistry	*46*	*43*	*42*				
125.	Vanderbilt University	17	27	29	.75	6.3	.75	.70
	Biochemistry	*48*	*54*	*52*	*60*	*46*	*45*	*60*
126.	Vermont, University of	9	8	19	NA	NA	NA	NA
	Biochemistry	*41*	*43*	*47*				
127.	Virginia Commonwealth University/Medical Col	19	13	21	.40	5.3	1.00	.70
	Biochemistry	*50*	*46*	*48*	*47*	*60*	*66*	*60*
128.	Virginia Polytechnic Institute & State Univ	16	7	11	NA	NA	NA	NA
	Biochemistry and Nutrition	*47*	*42*	*43*				
129.	Virginia, University of	15	11	12	NA	NA	NA	NA
	Biochemistry	*46*	*45*	*44*				
130.	Wake Forest University	15	5	9	NA	NA	NA	NA
	Biochemistry	*46*	*41*	*42*				
131.	Washington State University-Pullman	16	16	25	.18	5.3	.80	.30
	*Biochemistry and Biophysics**	*47*	*48*	*50*	*39*	*60*	*49*	*31*
132.	Washington, University of-Seattle	21	43	4	.90	5.9	.84	.63
	Biochemistry	*52*	*63*	*40*	*65*	*51*	*53*	*55*
133.	Wayne State University	18	13	17	.15	6.0	.69	.54
	Biochemistry	*49*	*46*	*46*	*38*	*50*	*40*	*48*
134.	West Virginia University	8	10	13	NA	NA	NA	NA
	Agricultural Biochemistry	*40*	*44*	*44*				
135.	West Virginia University	18	10	NA	NA	NA	NA	NA
	Medical Biochemistry	*49*	*44*					
136.	Wisconsin, University of-Madison	30	102	99	.68	5.7	.85	.64
	Biochemistry	*59*	*96*	*85*	*58*	*54*	*54*	*56*
137.	Wisconsin, University of-Madison	15	16	10	.83	6.5	.67	.50
	Physiological Chemistry	*46*	*48*	*43*	*63*	*42*	*38*	*45*
138.	Wyoming, University of	4	5	10	NA	NA	NA	NA
	Biochemistry	*37*	*41*	*43*				
139.	Yale University	64	88	127	.83	5.6	.83	.61
	Molec Biophysics & Biochem/Pharmacol/Biol	*89*	*88*	*98*	*63*	*55*	*51*	*54*

* indicates program was initiated since 1970.

NOTE: On the first line of data for every program, raw values for each measure are reported; on the second line values are reported in standardized form, with mean = 50 and standard deviation = 10. "NA" indicates that the value for a measure is not available.

TABLE 3.1 Program Measures (Raw and Standardized Values) in Biochemistry

Prog No.	Survey Results				University Library	Research Support		Published Articles		Survey Ratings Standard Error			
	(08)	(09)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(08)	(09)	(10)	(11)
121.	2.0	0.9	NA	0.3	NA	.62	4581	NA		.19	.15	NA	.06
	43	*33*		*41*		*50*	*44*		*NA*				
122.	1.4	NA	NA	0.2	NA	.50	1851	16		.21	NA	NA	.05
	37			*38*		*44*	*40*	*42*	*42*				
123.	2.0	1.1	NA	0.3	-1.0	.42	3690	45		.24	.17	NA	.06
	44	*38*		*41*	*38*	*40*	*43*	*45*	*44*				
124.	2.8	1.8	0.9	0.5	-0.6	.71	6905	36		.14	.16	.15	.07
	52	*51*	*37*	*47*	*42*	*54*	*48*	*44*	*44*				
125.	3.2	2.0	1.2	1.0	-0.7	1.00	5204	151		.10	.06	.09	.07
	56	*56*	*52*	*57*	*41*	*67*	*45*	*57*	*59*				
126.	1.8	1.1	1.3	0.4	NA	NA	4628	25		.16	.14	.15	.07
	41	*37*	*57*	*44*			*44*	*43*	*42*				
127.	2.2	1.7	1.7	0.4	NA	.63	6556	79		.15	.14	.15	.06
	45	*50*	*73*	*43*		*50*	*47*	*49*	*48*				
128.	1.8	1.3	1.2	0.3	-0.0	.56	3108	43		.16	.17	.22	.06
	41	*42*	*52*	*42*	*48*	*47*	*42*	*45*	*43*				
129.	3.1	1.9	1.3	0.7	0.7	.87	6224	100		.12	.09	.09	.08
	55	*53*	*57*	*50*	*56*	*61*	*47*	*51*	*53*				
130.	1.8	1.0	1.0	0.4	NA	.40	3010	29		.12	.14	.09	.06
	41	*35*	*43*	*43*		*40*	*42*	*43*	*43*				
131.	2.7	1.8	1.4	0.6	-0.3	.88	998	68		.12	.08	.12	.07
	50	*52*	*63*	*48*	*45*	*61*	*39*	*47*	*45*				
132.	3.8	2.2	1.1	1.3	1.5	.86	14164	222		.08	.06	.08	.07
	62	*61*	*48*	*65*	*63*	*60*	*59*	*64*	*67*				
133.	2.6	1.6	0.8	0.5	-0.4	.44	6372	51		.12	.11	.12	.06
	49	*48*	*34*	*47*	*45*	*42*	*47*	*45*	*43*				
134.	1.1	NA	NA	0.1	NA	NA	NA	9		.15	NA	NA	.03
	34			*35*				*41*	*41*				
135.	2.0	1.4	1.1	0.3	NA	.61	NA	33		.15	.11	.18	.06
	43	*43*	*49*	*42*		*49*		*43*	*43*				
136.	4.6	2.7	1.1	1.7	1.6	.87	19738	290		.06	.05	.07	.05
	71	*70*	*46*	*74*	*64*	*61*	*68*	*72*	*70*				
137.	3.5	2.2	1.0	1.0	1.6	.80	19738	157		.11	.07	.08	.07
	59	*59*	*41*	*58*	*64*	*58*	*68*	*57*	*57*				
138.	1.2	1.0	NA	0.3	NA	NA	NA	12		.20	.19	NA	.06
	35	*35*		*41*				*41*	*42*				
139.	4.5	2.6	1.4	1.5	2.1	.78	4337	373		.07	.07	.08	.07
	70	*68*	*63*	*70*	*69*	*57*	*44*	*81*	*87*				

NOTE: On the first line of data for every program, raw values for each measure are reported; on the second line values are reported in standardized form, with mean = 50 and standard deviation = 10. "NA" indicates that the value for a measure is not available. Since the scale used to compute measure 16 is entirely arbitrary, only values in standardized form are reported for this measure.

TABLE 3.2 Summary Statistics Describing Each Program Measure--Biochemistry

Measure	Number of Programs Evaluated	Mean	Standard Deviation	DECILES 1	2	3	4	5	6	7	8	9
Program Size												
01 Raw Value	139	19	11	7	10	13	15	16	18	21	25	35
Std Value	139	50	10	39	42	45	46	47	49	52	55	64
02 Raw Value	136	20	18	6	8	10	13	15	19	22	27	40
Std Value	136	50	10	42	43	44	46	47	49	51	54	61
03 Raw Value	136	25	21	6	10	13	15	20	24	27	35	52
Std Value	136	50	10	41	43	44	45	47	49	51	55	63
Program Graduates												
04 Raw Value	95	.47	.28	.11	.23	.27	.33	.39	.57	.67	.76	.88
Std Value	95	50	10	37	41	43	45	47	54	57	60	65
05 Raw Value	94	6.0	.7	6.9	6.5	6.2	6.0	5.9	5.8	5.7	5.4	5.2
Std Value	94	50	10	37	42	47	50	51	52	54	58	61
06 Raw Value	94	.81	.12	.67	.72	.74	.79	.83	.85	.88	.90	.94
Std Value	94	50	10	39	43	44	48	52	53	56	58	61
07 Raw Value	94	.56	.14	.33	.47	.52	.55	.58	.61	.64	.67	.73
Std Value	94	50	10	34	44	47	49	51	54	56	58	62
Survey Results												
08 Raw Value	138	2.6	1.0	1.4	1.8	2.0	2.3	2.5	2.7	3.0	3.4	4.0
Std Value	138	50	10	37	41	43	47	49	51	54	58	64
09 Raw Value	126	1.7	.5	1.1	1.3	1.5	1.6	1.7	1.8	2.0	2.1	2.4
Std Value	126	50	10	37	41	45	48	50	52	56	58	64
10 Raw Value	109	1.2	.2	.9	1.0	1.0	1.1	1.1	1.2	1.2	1.3	1.4
Std Value	109	50	10	39	43	43	48	48	52	52	57	61
11 Raw Value	138	.7	.4	.2	.3	.4	.5	.5	.6	.8	1.0	1.3
Std Value	138	50	10	39	41	44	46	46	49	53	58	65
University Library												
12 Raw Value	88	.2	1.0	-1.0	-.6	-.5	-.3	.0	.3	.7	.9	1.6
Std Value	88	50	10	38	42	43	45	48	51	55	57	64
Research Support												
13 Raw Value	115	.63	.22	.35	.44	.52	.60	.65	.70	.77	.83	.88
Std Value	115	50	10	37	41	45	49	51	53	56	59	61
14 Raw Value	104	8419	6463	2950	3195	4445	5614	6462	7267	9120	12650	16796
Std Value	104	50	10	42	42	44	46	47	48	51	57	63
Publication Records												
15 Raw Value	133	92	90	13	26	34	47	63	73	94	152	224
Std Value	133	50	10	41	43	44	45	47	48	50	57	65
16 Std Value	133	50	10	42	43	44	45	46	47	51	55	65

NOTE: Standardized values reported in the preceding table have been computed from exact values of the mean and standard deviation and not the rounded values reported here. Since the scale used to compute measure 16 is entirely arbitrary, only data in standardized form are reported for this measure.

TABLE 3.3 Intercorrelations Among Program Measures on 139 Programs in Biochemistry

	Measure															
	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16
Program Size																
01		.48	.57	.26	.03	-.07	.09	.58	.54	.38	.53	.40	.08	.33	.62	.58
02			.72	.47	.16	.23	.27	.63	.67	.14	.63	.46	.35	.46	.66	.65
03				.29	.17	.15	.18	.60	.61	.26	.59	.48	.32	.27	.59	.55
Program Graduates																
04					.11	.27	.39	.70	.70	.04	.70	.54	.42	.50	.59	.62
05						.28	.34	.15	.21	.22	.17	.02	.16	.03	.11	.12
06							.66	.24	.27	.18	.25	.09	.28	.12	.20	.22
07								.35	.36	.14	.34	.16	.33	.29	.33	.34
Survey Results																
08									.96	.21	.96	.63	.62	.69	.83	.83
09										.27	.92	.61	.58	.64	.79	.79
10											.21	.10	.17	.03	.31	.28
11												.64	.60	.69	.84	.85
University Library																
12													.21	.56	.67	.66
Research Support																
13														.30	.48	.47
14															.71	.71
Publication Records																
15																.98
16																

NOTE: Since in computing correlation coefficients program data must be available for both of the measures being correlated, the actual number of programs on which each coefficient is based varies.

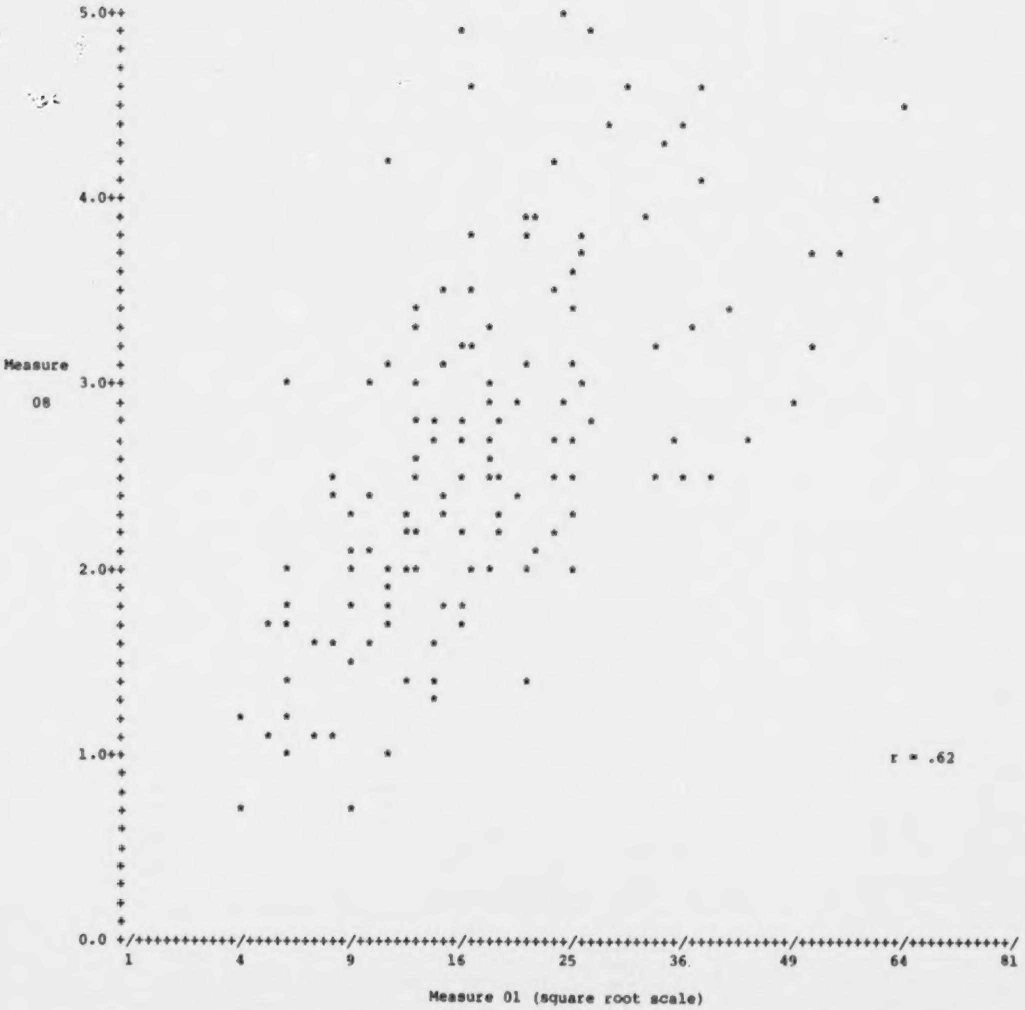

FIGURE 3.1 Mean rating of scholarly quality of faculty (measure 08) versus number of faculty members (measure 01)--138 programs in biochemistry.

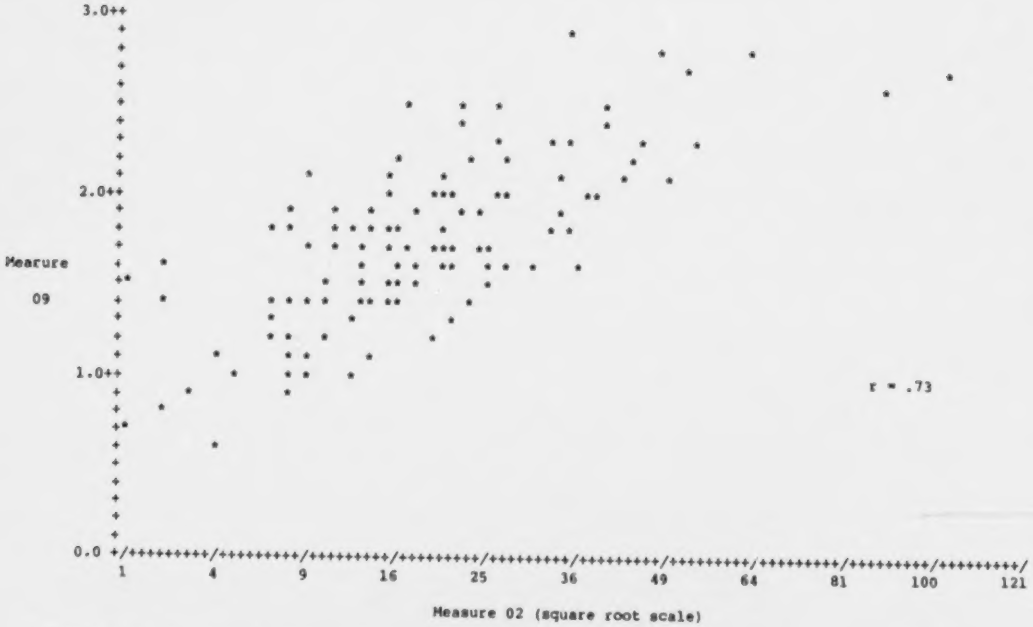

FIGURE 3.2 Mean rating of program effectiveness in educating research scholars/scientists (measure 09) versus number of graduates in last five years (measure 02)--124 programs in biochemistry.

TABLE 3.4 Characteristics of Survey Participants in Biochemistry

	Respondents	
	N	%
Field of Specialization		
Biochemistry	179	77
Molecular Biology	33	14
Other/Unknown	22	9
Faculty Rank		
Professor	118	50
Associate Professor	82	35
Assistant Professor	34	15
Year of Highest Degree		
Pre-1950	21	9
1950-59	40	17
1960-69	108	46
Post-1969	60	26
Unknown	5	2
Evaluator Selection		
Nominated by Institution	191	82
Other	43	18
Survey Form		
With Faculty Names	210	90
Without Names	24	10
Total Evaluators	234	100

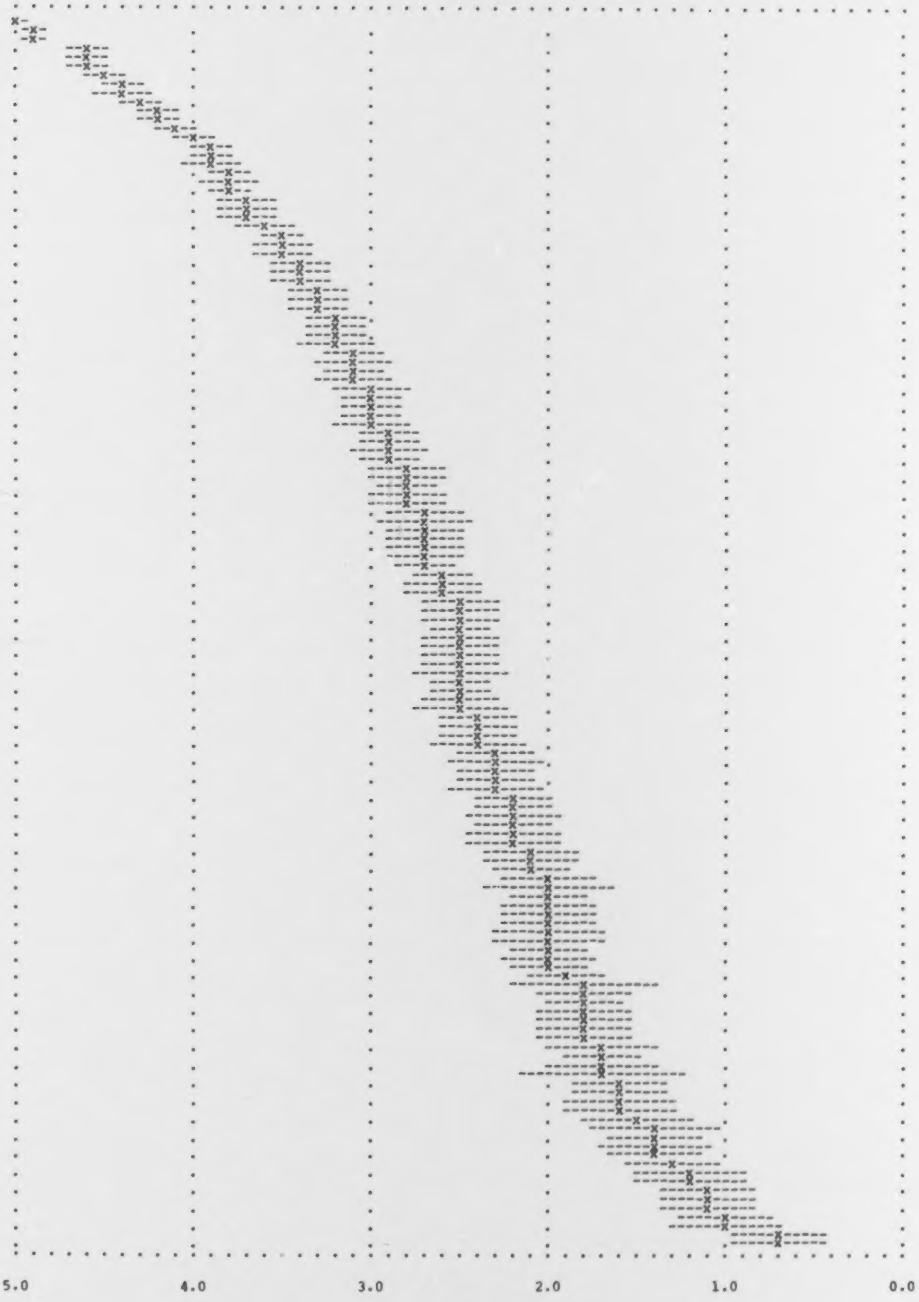

FIGURE 3.3 Mean rating of scholarly quality of faculty in 138 programs in biochemistry.

NOTE: Programs are listed in sequence of mean rating, with the highest-rated program appearing at the top of the page. The broken lines (---) indicate a confidence interval of ±1.5 standard errors around the reported mean (x) of each program.

IV

Botany Programs

In this chapter 83 research-doctorate programs in botany are assessed. These programs, according to the information supplied by their universities, have accounted for 1,574 doctoral degrees awarded during the FY1976-80 period.[1] On the average, 20 full-time and part-time students intending to earn doctorates were enrolled in a program in December 1980, with an average faculty size of 19 members.[2] A majority of the 83 programs, listed in Table 4.1, are located in botany or botanical science departments. Approximately one-third are found in departments of plant pathology or plant physiology. Four programs were initiated since 1970. Each of 11 institutions--Clemson University, University of Georgia, University of Illinois, Iowa State University, University of Missouri, North Carolina State University, Ohio State University, Oklahoma State University, Pennsylvania State University, Virginia Polytechnic Institute and State University, and University of Wisconsin (Madison)--has two botany programs evaluated in this study. Each of five institutions--University of California (Berkeley), University of California (Davis), University of Kentucky, University of Minnesota, and Texas A&M University--has three botany programs evaluated. In addition to the 62 institutions represented in this discipline, another 2 were initially identified as meeting the criteria[3] for inclusion in the assessment:

Brandeis University
Harvard University

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[1] Data from the NRC's Survey of Earned Doctorates indicate that 1,488 research doctorates in botany, phytopathology, and plant physiology were awarded by U.S. universities between FY1976 and FY1980. Since the NRC figure is based on field of degree and not department, it may exclude some doctorates included in the numbers reported by the institutional coordinators.

[2] See the reported means for measures 03 and 01 in Table 4.2.

[3] As mentioned in Chapter I, the primary criterion for inclusion was that a university had awarded at least 7 doctorates in botany during the FY1976-78 period.

Botany programs at these two institutions have not been included in the evaluations in this discipline, since in each case the study coordinator indicated that the institution did not at that time have a research-doctorate program in botany.

Before examining individual program results presented in Table 4.1, the reader is urged to refer to Chapter II, in which each of the 16 measures used in the assessment is discussed. Summary statistics describing every measure are given in Table 4.2. For nine of the measures, data are reported for at least 78 of the 83 botany programs. For measures 04-07, which pertain to characteristics of the program graduates, data are presented for only approximately two-thirds of the programs; the other third had too few graduates on which to base statistics.[4] For measure 12, a composite index of the size of a university library, data are available for 68 programs. With respect to measure 13--the fraction of faculty with research grants from the National Institutes of Health, the National Science Foundation, or the Alcohol, Drug Abuse, and Mental Health Administration--data are reported for 45 programs that had at least 10 faculty members; for measure 14, the total university expenditures for research in the biological sciences, data are available for 69 programs. The programs not evaluated on measures 12, 13, and 14 are typically smaller--in terms of faculty size and graduate student enrollment--than other botany programs. Were data on these two measures available for all 83 programs, it is likely that their reported means would be appreciably lower (and that some of the correlations of these measures with others would be higher).

Intercorrelations among the 16 measures (Pearson product-moment coefficients) are given in Table 4.3. Of particular note are the moderately high positive correlations of the measures of the numbers of faculty (01) and students (03) with reputational survey ratings (08, 09). Figure 4.1 illustrates the relation between the mean rating of the scholarly quality of faculty (measure 08) and the number of faculty members (measure 01) for each of 83 programs in botany. Figure 4.2 plots the mean rating of program effectiveness (measure 09) against the total number of FY1976-80 program graduates (measure 02). Although in both figures there is a significant positive correlation between program size and reputational rating, it is quite apparent that some of the smaller programs received high mean ratings.

Table 4.4 describes the 153 faculty members who participated in the evaluation of botany programs. These individuals constituted 61 percent of those asked to respond to the survey in this discipline and 10 percent of the faculty population in the 83 research-doctorate programs being evaluated.[5] Approximately three-fourths of the survey participants were botanists, plant physiologists, or phytopathologists; the remainder were in ecology or other biological science fields. More than two-thirds of the survey participants had earned their highest degree prior to 1970, and a majority held the rank of full professor.

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[4] As mentioned in Chapter II, data for measures 04-07 are not reported if they are based on the survey responses of fewer than 10 FY1975-79 program graduates.

[5] See Table 2.3 in Chapter II.

To assist the reader in interpreting results of the survey evaluations, estimated standard errors have been computed for mean ratings of the scholarly quality of faculty in 83 botany programs (and are given in Table 4.1). For each program the mean rating and an associated "confidence interval" of 1.5 standard errors are illustrated in Figure 4.3 (listed in order of highest to lowest mean rating). In comparing two programs, if their confidence intervals do not overlap, one may conclude that there is a significant difference in their mean ratings at a .05 level of significance.[6] From this figure it is also apparent that one should have somewhat more confidence in the accuracy of the mean ratings of higher-rated programs than lower-rated programs. This generalization results primarily from the fact that evaluators are not as likely to be familiar with the less prestigious programs, and consequently the mean ratings of these programs are usually based on fewer survey responses.

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[6] See pp. 31-33 for a discussion of the interpretation of mean ratings and associated confidence intervals.

TABLE 4.1 Program Measures (Raw and Standardized Values) in Botany

Prog No.	University - Department/Academic Unit	Program Size (01)	(02)	(03)	Characteristics of Program Graduates (04)	(05)	(06)	(07)
001.	Arizona, University of-Tucson	9	10	11	NA	NA	NA	NA
	Botany	*43*	*46*	*44*				
002.	Auburn University	15	9	3	NA	NA	NA	NA
	Botany, Plant Pathology, and Microbiology	*47*	*46*	*38*				
003.	Brigham Young University	12	18	16	.08	5.5	.58	.25
	Botany and Range Science	*45*	*49*	*47*	*40*	*63*	*44*	*45*
004.	California, University of-Irvine	9	9	8	NA	NA	NA	NA
	Dev & Cell Bio/Ecol & Evolut Bio/Molec Bio	*43*	*46*	*42*				
005.	California, University of-Berkeley	15	42	40	.34	5.8	.86	.60
	Botany	*47*	*60*	*64*	*60*	*58*	*62*	*70*
006.	California, University of-Berkeley	16	14	19	.13	5.2	.83	.17
	Plant Pathology	*48*	*48*	*49*	*44*	*67*	*61*	*39*
007.	California, University of-Berkeley	35	4	7	.19	6.6	.85	.60
	Plant Physiology	*62*	*43*	*41*	*48*	*48*	*62*	*70*
008.	California, University of-Davis	55	38	20	.21	6.8	.61	.34
	Botany	*76*	*58*	*50*	*50*	*45*	*46*	*52*
009.	California, University of-Davis	20	29	NA	.15	5.4	.81	.46
	Plant Pathology	*51*	*54*		*45*	*64*	*59*	*60*
010.	California, University of-Davis	85	41	NA	.09	6.4	.64	.34
	Plant Physiology	*98*	*60*		*41*	*50*	*48*	*52*
011.	California, University of-Los Angeles	20	28	21	.31	5.5	.54	.46
	Biology	*51*	*54*	*51*	*58*	*63*	*41*	*60*
012.	California, University of-Riverside	15	31	37	.04	6.2	.70	.30
	Plant Pathology	*47*	*55*	*61*	*37*	*54*	*52*	*49*
013.	Chicago, University of	5	8	13	NA	NA	NA	NA
	Biology	*40*	*45*	*45*				
014.	Claremont Graduate School	5	4	4	NA	NA	NA	NA
	Botany	*40*	*43*	*39*				
015.	Clemson University	12	8	3	NA	NA	NA	NA
	Plant Pathology	*45*	*45*	*38*				
016.	Clemson University	11	6	16	NA	NA	NA	NA
	Plant Physiology	*44*	*44*	*47*				
017.	Colorado State University-Fort Collins	27	8	11	.00	5.5	.70	.30
	Botany and Plant Pathology	*56*	*45*	*44*	*34*	*63*	*52*	*49*
018.	Colorado, University of	10	11	14	.14	8.0	.36	.14
	Environmental, Population & Organismic Bio	*43*	*46*	*46*	*45*	*29*	*29*	*37*
019.	Connecticut, University of-Storrs	13	9	20	NA	NA	NA	NA
	Biological Sciences	*45*	*46*	*50*				
020.	Cornell University-Ithaca	26	59	38	.18	6.5	.78	.42
	Botany	*55*	*67*	*62*	*47*	*50*	*57*	*58*

* indicates program was initiated since 1970.

NOTE: On the first line of data for every program, raw values for each measure are reported; on the second line values are reported in standardized form, with mean = 50 and standard deviation = 10. "NA" indicates that the value for a measure is not available.

TABLE 4.1 Program Measures (Raw and Standardized Values) in Botany

Prog No.	Survey Results				University Library	Research Support		Published Articles		Survey Ratings Standard Error			
	(08)	(09)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(08)	(09)	(10)	(11)
001.	2.2	1.6	1.0	0.4	0.9	NA	7828	32		.13	.11	.10	.06
	40	*45*	*38*	*40*	*55*		*49*	*45*	*45*				
002.	2.3	1.5	1.2	0.6	NA	.00	NA	28		.15	.09	.11	.07
	41	*42*	*54*	*46*		*37*		*44*	*44*				
003.	2.4	1.7	1.2	0.5	-0.6	.08	NA	10		.12	.08	.09	.06
	43	*47*	*49*	*44*	*41*	*41*		*40*	*42*				
004.	3.0	1.8	1.1	0.7	NA	NA	6547	16		.13	.07	.11	.07
	50	*50*	*44*	*49*			*47*	*41*	*43*				
005.	4.3	2.5	0.9	1.1	2.2	.73	18977	101		.08	.06	.09	.08
	65	*65*	*34*	*66*	*69*	*71*	*69*	*58*	*56*				
006.	3.8	2.1	1.2	0.7	2.2	.06	18977	101		.12	.06	.12	.09
	59	*56*	*50*	*49*	*69*	*40*	*69*	*58*	*56*				
007.	4.2	2.3	1.1	0.9	2.2	.31	18977	101		.08	.08	.10	.08
	64	*60*	*44*	*57*	*69*	*52*	*69*	*58*	*56*				
008.	4.5	2.6	1.4	1.4	0.6	.26	18053	208		.07	.06	.08	.08
	68	*67*	*63*	*74*	*53*	*49*	*67*	*79*	*86*				
009.	4.3	2.5	1.2	0.6	0.6	.20	18053	208		.11	.08	.10	.09
	66	*66*	*52*	*48*	*53*	*47*	*67*	*79*	*86*				
010.	4.5	2.6	1.5	1.2	0.6	.24	18053	208		.07	.06	.08	.08
	68	*68*	*65*	*66*	*53*	*48*	*67*	*79*	*86*				
011.	3.8	2.1	1.2	1.0	2.0	.65	15581	25		.09	.06	.08	.08
	60	*57*	*51*	*62*	*66*	*67*	*63*	*43*	*49*				
012.	3.9	2.3	1.3	0.8	-1.0	.40	6232	117		.13	.07	.09	.09
	61	*61*	*58*	*54*	*37*	*56*	*46*	*61*	*59*				
013.	2.6	1.7	0.9	0.6	0.9	NA	17589	14		.15	.10	.12	.06
	45	*48*	*37*	*46*	*55*		*66*	*41*	*43*				
014.	3.4	1.7	0.8	0.7	NA	NA	NA	1		.15	.12	.07	.08
	55	*47*	*27*	*52*				*38*	*40*				
015.	1.9	1.3	NA	0.2	NA	.00	1275	13		.18	.11	NA	.05
	36	*39*		*35*		*37*	*37*	*41*	*41*				
016.	1.3	0.8	NA	0.2	NA	.00	1275	13		.26	.17	NA	.04
	29	*27*		*32*		*37*	*37*	*41*	*41*				
017.	3.0	1.8	1.3	0.9	-1.1	.04	8863	47		.12	.07	.08	.07
	49	*50*	*55*	*57*	*36*	*39*	*51*	*48*	*48*				
018.	2.4	1.7	1.4	0.4	-0.9	.40	11967	12		.18	.14	.15	.07
	42	*46*	*63*	*40*	*38*	*56*	*56*	*41*	*44*				
019.	2.6	1.7	1.3	0.7	-0.5	.39	15199	14		.09	.07	.09	.07
	45	*47*	*55*	*49*	*42*	*55*	*62*	*41*	*43*				
020.	4.2	2.5	1.2	1.1	1.6	.31	14597	169		.07	.06	.09	.08
	65	*65*	*51*	*66*	*63*	*51*	*61*	*71*	*68*				

NOTE: On the first line of data for every program, raw values for each measure are reported; on the second line values are reported in standardized form, with mean = 50 and standard deviation = 10. "NA" indicates that the value for a measure is not available. Since the scale used to compute measure 16 is entirely arbitrary, only values in standardized form are reported for this measure.

TABLE 4.1 Program Measures (Raw and Standardized Values) in Botany

Prog No.	University - Department/Academic Unit	Program Size (01)	Program Size (02)	Program Size (03)	Characteristics of Program Graduates (04)	Characteristics of Program Graduates (05)	Characteristics of Program Graduates (06)	Characteristics of Program Graduates (07)
021.	Duke University	19	35	59	.43	6.0	.59	.41
	Botany	*50*	*57*	*77*	*66*	*56*	*44*	*57*
022.	Florida, University of-Gainesville	42	28	60	.12	7.7	.74	.32
	Botany/Plant Pathology	*67*	*54*	*77*	*43*	*34*	*55*	*50*
023.	Georgia, University of-Athens	19	23	33	.36	7.0	.77	.41
	Botany	*50*	*52*	*59*	*61*	*43*	*57*	*57*
024.	Georgia, University of-Athens	19	10	7	.36	6.0	.36	.09
	Plant Pathology	*50*	*46*	*41*	*61*	*56*	*29*	*34*
025.	Hawaii, University of	41	20	21	.29	7.5	.71	.18
	*Botanical Sciences**	*66*	*50*	*51*	*56*	*36*	*52*	*40*
026.	Illinois, University-Urbana/Champaign	27	16	28	.25	5.9	.81	.50
	Botany	*56*	*49*	*55*	*53*	*57*	*59*	*63*
027.	Illinois, University-Urbana/Champaign	39	29	6	.03	5.7	.74	.26
	Plant Pathology and Plant Physiology	*65*	*54*	*40*	*37*	*61*	*54*	*46*
028.	Indiana University-Bloomington	14	23	22	.44	5.8	.50	.31
	Biology	*46*	*52*	*51*	*67*	*58*	*38*	*50*
029.	Iowa State University-Ames	20	20	23	.11	6.5	.83	.33
	Botany	*51*	*50*	*52*	*42*	*49*	*61*	*51*
030.	Iowa State University-Ames	16	11	12	NA	NA	NA	NA
	Plant Pathology, Seed and Weed Sciences	*48*	*46*	*44*				
031.	Iowa, University of-Iowa City	12	14	18	.19	6.0	.81	.44
	Botany	*45*	*48*	*48*	*48*	*56*	*59*	*59*
032.	Kansas State University-Manhattan	13	4	10	NA	NA	NA	NA
	Plant Pathology	*45*	*43*	*43*				
033.	Kansas, University of	11	7	9	NA	NA	NA	NA
	Botany	*44*	*45*	*42*				
034.	Kentucky, University of	7	3	4	NA	NA	NA	NA
	Biological Sciences	*41*	*43*	*39*				
035.	Kentucky, University of	14	9	11	NA	NA	NA	NA
	Plant Pathology (College of Agriculture)	*46*	*46*	*44*				
036.	Kentucky, University of	10	5	9	NA	NA	NA	NA
	Plant Physiology (College of Agriculture)	*43*	*44*	*42*				
037.	Louisiana State University-Baton Rouge	7	5	6	NA	NA	NA	NA
	Botany	*41*	*44*	*40*				
038.	Maryland, University of-College Park	21	31	59	.08	6.8	.54	.19
	Botany	*51*	*55*	*77*	*40*	*45*	*41*	*41*
039.	Massachusetts, University of-Amherst	18	20	27	.44	6.5	.72	.33
	Botany	*49*	*50*	*55*	*68*	*49*	*53*	*51*
040.	Miami University-Ohio	14	12	15	.08	5.5	.91	.46
	Botany	*46*	*47*	*46*	*40*	*63*	*66*	*60*

* indicates program was initiated since 1970.

NOTE: On the first line of data for every program, raw values for each measure are reported; on the second line values are reported in standardized form, with mean = 50 and standard deviation = 10. "NA" indicates that the value for a measure is not available.

TABLE 4.1 Program Measures (Raw and Standardized Values) in Botany

Prog	Survey Results				University Library	Research Support		Published Articles		Survey Ratings Standard Error			
No.	(08)	(09)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(08)	(09)	(10)	(11)
021.	4.0	2.5	1.2	1.0	0.3	.84	11320	22		.10	.07	.09	.09
	62	*65*	*50*	*62*	*50*	*76*	*55*	*43*	*44*				
022.	3.1	1.9	1.3	1.0	0.8	.10	3486	94		.09	.05	.09	.07
	51	*52*	*58*	*62*	*54*	*42*	*41*	*57*	*50*				
023.	3.7	2.1	1.5	1.0	0.4	.63	10714	126		.08	.06	.09	.08
	58	*56*	*69*	*62*	*51*	*66*	*54*	*63*	*59*				
024.	3.0	1.9	1.4	0.5	0.4	.05	10714	126		.16	.11	.10	.08
	50	*52*	*65*	*44*	*51*	*40*	*54*	*63*	*59*				
025.	3.0	1.8	1.3	0.6	-0.1	.20	4440	63		.13	.09	.09	.07
	49	*48*	*59*	*48*	*45*	*46*	*43*	*51*	*46*				
026.	3.8	2.2	1.2	1.0	2.0	.41	6074	134		.07	.05	.09	.08
	60	*58*	*52*	*63*	*66*	*56*	*46*	*65*	*66*				
027.	3.9	2.3	1.4	1.0	2.0	.28	6074	134		.10	.07	.09	.08
	60	*61*	*62*	*62*	*66*	*50*	*46*	*65*	*66*				
028.	3.7	2.1	1.0	1.0	0.9	.57	NA	24		.09	.06	.08	.09
	58	*57*	*40*	*62*	*56*	*64*		*43*	*46*				
029.	3.2	1.9	1.1	0.6	-0.5	.10	5287	57		.10	.06	.07	.08
	52	*52*	*46*	*46*	*42*	*42*	*45*	*49*	*48*				
030.	3.0	1.9	1.0	0.6	-0.5	.00	5287	57		.15	.06	.11	.08
	50	*51*	*38*	*45*	*42*	*37*	*45*	*49*	*48*				
031.	2.6	1.7	0.9	0.5	0.3	.25	7088	10		.13	.09	.13	.07
	45	*47*	*37*	*45*	*50*	*49*	*48*	*40*	*43*				
032.	2.7	1.6	1.5	0.5	NA	.15	2496	22		.16	.12	.13	.07
	46	*44*	*69*	*42*		*44*	*40*	*43*	*42*				
033.	2.7	1.8	1.1	0.6	0.1	.55	3161	9		.12	.11	.10	.07
	46	*49*	*48*	*46*	*48*	*62*	*41*	*40*	*42*				
034.	1.9	1.0	NA	0.4	-0.1	NA	484	46		.18	.15	NA	.07
	36	*31*		*39*	*46*		*36*	*47*	*46*				
035.	3.3	2.0	1.6	0.6	-0.1	.00	484	46		.11	.07	.09	.08
	53	*54*	*72*	*48*	*46*	*37*	*36*	*47*	*46*				
036.	2.7	1.6	1.3	0.4	-0.1	.30	484	46		.15	.10	.12	.07
	45	*45*	*55*	*41*	*46*	*51*	*36*	*47*	*46*				
037.	1.9	1.3	1.1	0.4	-0.3	NA	5116	38		.17	.13	.12	.06
	36	*38*	*46*	*40*	*43*		*44*	*46*	*44*				
038.	2.7	1.7	1.2	0.8	0.2	.24	1623	20		.12	.08	.11	.07
	47	*48*	*53*	*52*	*48*	*48*	*38*	*42*	*43*				
039.	3.4	1.8	1.1	0.9	-0.7	.33	3022	36		.11	.07	.08	.08
	54	*50*	*43*	*56*	*40*	*53*	*41*	*45*	*46*				
040.	3.1	1.8	1.3	0.6	-0.8	.43	NA	14		.13	.09	.09	.07
	51	*50*	*55*	*49*	*39*	*57*		*41*	*43*				

NOTE: On the first line of data for every program, raw values for each measure are reported; on the second line values are reported in standardized form, with mean = 50 and standard deviation = 10. "NA" indicates that the value for a measure is not available. Since the scale used to compute measure 16 is entirely arbitrary, only values in standardized form are reported for this measure.

TABLE 4.1 Program Measures (Raw and Standardized Values) in Botany

Prog No.	University - Department/Academic Unit	Program Size			Characteristics of Program Graduates			
		(01)	(02)	(03)	(04)	(05)	(06)	(07)
041.	Michigan State University-East Lansing	28	46	53	.19	6.6	.63	.31
	Botany and Plant Pathology	*56*	*62*	*72*	*48*	*48*	*47*	*50*
042.	Michigan, University of-Ann Arbor	74	31	41	.41	6.3	.57	.32
	Biological Sciences	*90*	*55*	*64*	*65*	*52*	*43*	*51*
043.	Minnesota, University of	26	8	12	.40	8.0	.54	.15
	Agriculture/ Biological Sciences/ Forestry	*55*	*45*	*44*	*64*	*29*	*41*	*38*
044.	Minnesota, University of	18	20	6	.32	7.5	.43	.10
	Botany	*49*	*50*	*40*	*58*	*36*	*34*	*34*
045.	Minnesota, University of	18	22	17	.20	7.5	.64	.36
	Plant Pathology	*49*	*51*	*48*	*49*	*36*	*48*	*53*
046.	Missouri, University of-Columbia	8	7	11	NA	NA	NA	NA
	Biological Sciences	*42*	*45*	*44*				
047.	Missouri, University of-Columbia	10	8	14	NA	NA	NA	NA
	*Plant Pathology**	*43*	*45*	*46*				
048.	Montana, University of-Missoula	10	10	10	.27	7.0	.50	.10
	Botany	*43*	*46*	*43*	*55*	*43*	*38*	*34*
049.	Nebraska, University of-Lincoln	24	17	27	.18	6.1	.80	.50
	Life Sciences	*54*	*49*	*55*	*48*	*54*	*59*	*63*
050.	North Carolina State University-Raleigh	20	20	26	.17	7.4	.89	.33
	Botany	*51*	*50*	*54*	*46*	*38*	*64*	*51*
051.	North Carolina State University-Raleigh	36	19	36	.21	6.8	.95	.32
	Plant Pathology	*62*	*50*	*61*	*50*	*46*	*68*	*50*
052.	North Carolina, University of-Chapel Hill	19	15	27	.25	6.2	.65	.40
	Botany	*50*	*48*	*55*	*53*	*54*	*48*	*56*
053.	North Dakota State University-Fargo	8	13	10	NA	NA	NA	NA
	Botany	*42*	*47*	*43*				
054.	North Dakota, University of-Grand Forks	2	4	10	NA	NA	NA	NA
	Biology	*37*	*43*	*43*				
055.	Ohio State University-Columbus	21	22	19	.13	5.5	.83	.30
	Botany	*51*	*51*	*49*	*44*	*63*	*60*	*49*
056.	Ohio State University-Columbus	22	8	19	.20	5.0	.60	.20
	Plant Pathology	*52*	*45*	*49*	*49*	*70*	*45*	*42*
057.	Oklahoma State University-Stillwater	7	4	4	NA	NA	NA	NA
	Botany	*41*	*43*	*39*				
058.	Oklahoma State University-Stillwater	40	194	42	.03	6.5	.50	.08
	Plant Sciences	*65*	*99*	*65*	*36*	*49*	*38*	*33*
059.	Oklahoma, University of-Norman	12	12	10	.17	6.9	.67	.08
	Botany/Microbiology	*45*	*47*	*43*	*46*	*44*	*50*	*33*
060.	Oregon State University-Corvallis	27	30	41	.16	6.6	.63	.27
	Botany and Plant Pathology	*56*	*55*	*64*	*46*	*48*	*47*	*46*

* indicates program was initiated since 1970.

NOTE: On the first line of data for every program, raw values for each measure are reported; on the second line values are reported in standardized form, with mean = 50 and standard deviation = 10. "NA" indicates that the value for a measure is not available.

TABLE 4.1 Program Measures (Raw and Standardized Values) in Botany

Prog	Survey Results				University Library	Research Support		Published Articles		Survey Ratings Standard Error			
No.	(08)	(09)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(08)	(09)	(10)	(11)
041.	3.8	2.3	1.1	1.4	0.3	.25	10357	151		.08	.05	.08	.07
	60	*60*	*46*	*75*	*50*	*49*	*53*	*68*	*71*				
042.	4.2	2.5	1.1	1.0	1.8	.61	15431	52		.13	.09	.10	.09
	64	*65*	*43*	*62*	*64*	*65*	*62*	*48*	*49*				
043.	3.3	1.9	1.3	0.5	1.2	.35	13696	98		.12	.09	.10	.07
	54	*52*	*57*	*43*	*58*	*53*	*59*	*58*	*53*				
044.	3.3	1.9	1.1	0.6	1.2	.39	13696	98		.11	.06	.10	.07
	54	*52*	*48*	*46*	*58*	*55*	*59*	*58*	*53*				
045.	3.5	2.3	1.2	0.7	1.2	.11	13696	98		.18	.10	.11	.09
	55	*60*	*49*	*50*	*58*	*42*	*59*	*58*	*53*				
046.	2.2	1.4	0.9	0.4	-0.2	NA	4628	35		.17	.11	.10	.06
	39	*39*	*36*	*41*	*45*		*43*	*45*	*45*				
047.	2.9	1.7	1.1	0.6	-0.2	.20	4628	35		.12	.08	.08	.08
	48	*47*	*46*	*45*	*45*	*47*	*43*	*45*	*45*				
048.	1.8	1.2	0.9	0.4	NA	.10	NA	0		.14	.09	.08	.07
	35	*35*	*36*	*42*		*42*		*38*	*40*				
049.	3.1	1.9	1.4	0.9	-0.5	.25	2965	42		.14	.09	.09	.08
	51	*51*	*62*	*57*	*42*	*49*	*40*	*47*	*47*				
050.	2.8	1.9	1.2	0.5	NA	.05	6741	115		.13	.08	.10	.07
	47	*52*	*52*	*45*		*40*	*47*	*61*	*55*				
051.	3.8	2.3	1.4	0.7	NA	.00	6741	115		.13	.10	.12	.09
	59	*60*	*60*	*49*		*37*	*47*	*61*	*55*				
052.	3.7	2.2	1.3	0.9	1.0	.53	9849	15		.09	.06	.08	.08
	58	*57*	*59*	*59*	*56*	*61*	*53*	*41*	*42*				
053.	1.6	1.0	NA	0.3	NA	NA	5698	27		.16	.12	NA	.05
	33	*30*		*35*			*45*	*44*	*43*				
054.	0.6	0.4	NA	0.2	NA	NA	NA	2		.18	.15	NA	.04
	20	*17*		*31*				*39*	*40*				
055.	3.3	2.0	1.4	1.1	0.9	.29	8330	61		.11	.07	.10	.09
	53	*54*	*64*	*63*	*55*	*50*	*50*	*50*	*52*				
056.	2.8	1.8	1.2	0.5	0.9	.00	8330	61		.17	.09	.12	.08
	48	*49*	*52*	*43*	*55*	*37*	*50*	*50*	*52*				
057.	1.6	1.0	0.9	0.3	-1.9	NA	3127	22		.15	.11	.07	.05
	32	*31*	*33*	*37*	*27*		*41*	*43*	*43*				
058.	2.5	1.7	1.3	0.3	-1.9	.00	3127	22		.13	.12	.09	.05
	43	*48*	*55*	*37*	*27*	*37*	*41*	*43*	*43*				
059.	3.1	1.9	1.3	0.8	-0.6	.33	NA	15		.11	.08	.07	.08
	51	*50*	*57*	*55*	*41*	*53*		*41*	*45*				
060.	3.3	2.0	1.2	1.2	NA	.33	7108	112		.09	.05	.07	.07
	54	*54*	*49*	*67*		*53*	*48*	*60*	*56*				

NOTE: On the first line of data for every program, raw values for each measure are reported; on the second line values are reported in standardized form, with mean = 50 and standard deviation = 10. "NA" indicates that the value for a measure is not available. Since the scale used to compute measure 16 is entirely arbitrary, only values in standardized form are reported for this measure.

TABLE 4.1 Program Measures (Raw and Standardized Values) in Botany

Prog No.	University - Department/Academic Unit	Program Size (01)	(02)	(03)	Characteristics of Program Graduates (04)	(05)	(06)	(07)
061.	Oregon, University of-Eugene *Biology*	10 *43*	2 *42*	1 *37*	NA	NA	NA	NA
062.	Pennsylvania State University *Botany*	13 *45*	6 *44*	8 *42*	NA	NA	NA	NA
063.	Pennsylvania State University *Plant Pathology*	33 *60*	19 *50*	19 *49*	.19 *48*	7.0 *43*	.88 *64*	.50 *63*
064.	Purdue University-West Lafayette *Biological Sciences*	9 *43*	18 *49*	21 *51*	.46 *69*	5.7 *60*	.54 *41*	.25 *45*
065.	Rhode Island, University of *Botany*	13 *45*	10 *46*	10 *43*	NA	7.2 *40*	.40 *32*	.30 *49*
066.	Rutgers, The State University-New Brunswick *Botany/Plant Physiology*	30 *58*	17 *49*	33 *59*	.13 *43*	7.5 *36*	.44 *34*	.19 *41*
067.	SUNY-College of Environ Science & Forestry *Environmental and Forest Biology*	11 *44*	6 *44*	7 *41*	NA	NA	NA	NA
068.	Southern Illinois University-Carbondale *Botany*	15 *47*	17 *49*	23 *52*	.14 *45*	7.8 *33*	.71 *53*	.21 *43*
069.	Tennessee, University of-Knoxville *Botany*	16 *48*	19 *50*	19 *49*	.29 *56*	6.3 *53*	.69 *51*	.06 *32*
070.	Texas A & M University *Biology*	7 *41*	6 *44*	14 *46*	NA	NA	NA	NA
071.	Texas A & M University *Plant Pathology*	11 *44*	8 *45*	14 *46*	NA	NA	NA	NA
072.	Texas A & M University *Plant Physiology*	11 *44*	7 *45*	6 *40*	NA	NA	NA	NA
073.	Texas, University of-Austin *Botany*	23 *53*	34 *56*	33 *59*	.50 *72*	6.2 *53*	.60 *45*	.43 *58*
074.	Vanderbilt University *General Biology*	6 *40*	7 *45*	5 *40*	NA	NA	NA	NA
075.	Virginia Polytechnic Institute & State Univ *Plant Pathology & Physiology*	27 *56*	18 *49*	24 *53*	.00 *34*	6.1 *54*	.57 *43*	.14 *37*
076.	Virginia Polytechnic Institute & State Univ *Biology*	12 *45*	8 *45*	13 *45*	NA	NA	NA	NA
077.	Washington State University-Pullman *Botany*	12 *45*	15 *48*	15 *46*	.00 *34*	6.8 *46*	.58 *44*	.42 *57*
078.	Washington University-Saint Louis *Plant Biology**	11 *44*	6 *44*	11 *44*	NA	NA	NA	NA
079.	Washington, University of-Seattle *Botany*	17 *48*	19 *50*	19 *49*	.41 *65*	7.5 *36*	.65 *48*	.47 *61*
080.	Wisconsin, University of-Madison *Botany*	17 *48*	38 *58*	46 *68*	.17 *47*	6.1 *55*	.86 *62*	.57 *68*

* indicates program was initiated since 1970.

NOTE: On the first line of data for every program, raw values for each measure are reported; on the second line values are reported in standardized form, with mean = 50 and standard deviation = 10. "NA" indicates that the value for a measure is not available.

TABLE 4.1 Program Measures (Raw and Standardized Values) in Botany

Prog	Survey Results				University Library	Research Support		Published Articles		Survey Ratings Standard Error			
No.	(08)	(09)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(08)	(09)	(10)	(11)
061.	2.5	1.5	1.0	0.6	-0.9	.50	NA	6		.15	.09	.08	.08
	43	*43*	*39*	*45*	*37*	*60*		*39*	*40*				
062.	2.3	1.4	1.0	0.4	0.7	.39	8024	78		.16	.12	.11	.05
	42	*41*	*38*	*41*	*54*	*55*	*49*	*54*	*48*				
063.	3.7	2.2	1.3	0.6	0.7	.00	8024	78		.13	.11	.12	.09
	58	*59*	*56*	*46*	*54*	*37*	*49*	*54*	*48*				
064.	3.4	2.0	0.9	0.8	-0.5	NA	10337	106		.13	.07	.07	.08
	54	*54*	*35*	*55*	*41*		*53*	*59*	*60*				
065.	2.3	1.5	1.1	0.4	NA	.23	NA	22		.17	.13	.07	.06
	41	*42*	*47*	*41*		*48*		*43*	*42*				
066.	3.0	1.8	1.2	0.7	0.8	.13	7505	48		.10	.08	.08	.06
	50	*50*	*52*	*50*	*55*	*43*	*48*	*48*	*48*				
067.	3.1	1.9	1.0	0.3	NA	.27	NA	15		.16	.08	.10	.06
	51	*51*	*41*	*37*		*50*		*41*	*42*				
068.	2.3	1.3	0.9	0.5	-0.2	.00	NA	19		.14	.09	.10	.06
	41	*38*	*37*	*43*	*45*	*37*		*42*	*42*				
069.	2.7	1.8	1.0	0.5	-0.4	.06	NA	35		.13	.10	.09	.07
	46	*50*	*43*	*45*	*43*	*40*		*45*	*44*				
070.	2.0	1.4	0.9	0.5	-0.5	NA	3199	56		.18	.16	.11	.07
	37	*39*	*36*	*43*	*42*		*41*	*49*	*51*				
071.	2.2	1.5	1.2	0.5	-0.5	.00	3199	56		.15	.11	.10	.07
	40	*42*	*50*	*43*	*42*	*37*	*41*	*49*	*51*				
072.	2.6	1.7	1.0	0.4	-0.5	.18	3199	56		.20	.13	.10	.07
	45	*47*	*38*	*41*	*42*	*46*	*41*	*49*	*51*				
073.	4.5	2.6	1.4	1.2	1.6	.74	5757	36		.08	.06	.08	.08
	68	*67*	*60*	*69*	*63*	*71*	*45*	*45*	*46*				
074.	1.8	1.3	1.0	0.5	-0.7	NA	5204	11		.21	.13	.08	.08
	35	*37*	*38*	*42*	*39*		*44*	*40*	*43*				
075.	2.4	1.4	1.3	0.6	-0.0	.00	3108	42		.13	.10	.12	.08
	43	*40*	*56*	*45*	*46*	*37*	*41*	*47*	*45*				
076.	2.6	1.6	1.3	0.6	-0.0	.33	3108	42		.17	.11	.16	.08
	45	*45*	*59*	*47*	*46*	*53*	*41*	*47*	*45*				
077.	2.9	1.9	1.4	0.6	-0.3	.50	998	107		.11	.07	.11	.07
	48	*52*	*63*	*48*	*44*	*60*	*37*	*59*	*56*				
078.	3.6	2.0	1.5	0.8	-0.4	.55	16825	12		.14	.08	.11	.08
	56	*53*	*66*	*55*	*43*	*62*	*65*	*41*	*43*				
079.	3.7	2.1	1.3	1.0	1.5	.53	14164	40		.08	.04	.08	.08
	58	*55*	*59*	*62*	*61*	*62*	*60*	*46*	*49*				
080.	3.8	2.3	1.0	1.1	1.6	.65	19738	132		.08	.06	.09	.08
	60	*60*	*38*	*66*	*62*	*67*	*70*	*64*	*64*				

NOTE: On the first line of data for every program, raw values for each measure are reported; on the second line values are reported in standardized form, with mean = 50 and standard deviation = 10. "NA" indicates that the value for a measure is not available. Since the scale used to compute measure 16 is entirely arbitrary, only values in standardized form are reported for this measure.

TABLE 4.1 Program Measures (Raw and Standardized Values) in Botany

Prog No.	University - Department/Academic Unit	Program Size			Characteristics of Program Graduates			
		(01)	(02)	(03)	(04)	(05)	(06)	(07)
081.	Wisconsin, University of-Madison	27	24	45	.13	6.1	.73	.37
	Plant Pathology	*56*	*52*	*67*	*44*	*54*	*54*	*54*
082.	Wisconsin, University of-Milwaukee	9	NA	NA	NA	NA	NA	NA
	*Botany**	*43*						
083.	Yale University	21	49	57	.32	6.1	.92	.41
	Biology/Forestry and Environmental Studies	*51*	*63*	*75*	*58*	*54*	*66*	*56*

* indicates program was initiated since 1970.

NOTE: On the first line of data for every program, raw values for each measure are reported; on the second line values are reported in standardized form, with mean = 50 and standard deviation = 10. "NA" indicates that the value for a measure is not available.

TABLE 4.1 Program Measures (Raw and Standardized Values) in Botany

Prog	Survey Results				University Library	Research Support		Published Articles		Survey Ratings Standard Error			
No.	(08)	(09)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(08)	(09)	(10)	(11)
081.	4.3	2.6	1.1	0.9	1.6	.22	19738	132		.12	.08	.08	.10
	65	*66*	*45*	*57*	*62*	*48*	*70*	*64*	*64*				
082.	2.1	1.2	1.1	0.4	NA	NA	NA	NA		.17	.13	.13	.06
	38	*36*	*44*	*38*					*NA*				
083.	4.1	2.3	1.1	1.0	2.1	.48	4337	25		.09	.07	.08	.07
	63	*61*	*43*	*60*	*68*	*59*	*43*	*43*	*46*				

NOTE: On the first line of data for every program, raw values for each measure are reported; on the second line values are reported in standardized form, with mean = 50 and standard deviation = 10. "NA" indicates that the value for a measure is not available. Since the scale used to compute measure 16 is entirely arbitrary, only values in standardized form are reported for this measure.

TABLE 4.2 Summary Statistics Describing Each Program Measure--Botany

Measure	Number of Programs Evaluated	Mean	Standard Deviation	DECILES 1	2	3	4	5	6	7	8	9
Program Size												
01 Raw Value	83	19	14	7	10	11	13	15	18	20	26	34
Std Value	83	50	10	41	43	44	46	47	49	51	55	61
02 Raw Value	82	19	23	5	7	8	10	14	18	20	28	35
Std Value	82	50	10	44	45	45	46	48	49	50	54	57
03 Raw Value	80	20	15	6	8	10	13	16	19	23	33	41
Std Value	80	50	10	40	42	43	45	47	49	52	59	64
Program Graduates												
04 Raw Value	52	.21	.13	.04	.10	.13	.17	.19	.20	.28	.34	.41
Std Value	52	50	10	37	42	44	47	48	49	55	60	65
05 Raw Value	53	6.5	.8	7.5	7.3	6.8	6.6	6.4	6.2	6.1	5.8	5.5
Std Value	53	50	10	36	39	45	48	51	53	55	59	63
06 Raw Value	53	.67	.15	.46	.54	.58	.63	.66	.71	.77	.82	.86
Std Value	53	50	10	36	41	44	47	49	53	57	60	63
07 Raw Value	53	.32	.14	.10	.17	.25	.30	.32	.34	.41	.43	.49
Std Value	53	50	10	34	39	45	49	50	51	56	58	62
Survey Results												
08 Raw Value	83	3.0	.8	1.9	2.3	2.6	2.8	3.0	3.3	3.5	3.8	4.1
Std Value	83	50	10	36	41	45	47	50	53	56	59	63
09 Raw Value	83	1.8	.4	1.3	1.5	1.7	1.7	1.8	1.9	2.0	2.2	2.4
Std Value	83	50	10	38	43	47	47	49	52	54	58	63
10 Raw Value	78	1.2	.2	.9	1.0	1.1	1.1	1.2	1.2	1.3	1.3	1.4
Std Value	78	50	10	35	41	46	46	52	52	57	57	63
11 Raw Value	83	.7	.3	.4	.4	.5	.6	.6	.7	.8	1.0	1.1
Std Value	83	50	10	40	40	44	47	47	51	54	61	64
University Library												
12 Raw Value	68	.3	1.0	-.9	-.5	-.4	-.1	.2	.6	.9	1.2	1.8
Std Value	68	50	10	37	42	43	46	49	53	56	59	65
Research Support												
13 Raw Value	69	.28	.22	.00	.05	.10	.20	.25	.31	.39	.48	.58
Std Value	69	50	10	37	40	42	46	49	51	55	59	64
14 Raw Value	69	8406	5704	1588	3127	4409	5534	6741	8146	10714	14251	18053
Std Value	69	50	10	38	41	43	45	47	50	54	60	67
Publication Records												
15 Raw Value	82	60	51	11	15	22	34	42	56	78	104	131
Std Value	82	50	10	40	41	43	45	47	49	54	59	64
16 Std Value	82	50	10	42	43	44	45	46	48	52	56	63

NOTE: Standardized values reported in the preceding table have been computed from exact values of the mean and standard deviation and not the rounded values reported here. Since the scale used to compute measure 16 is entirely arbitrary, only data in standardized form are reported for this measure.

TABLE 4.3 Intercorrelations Among Program Measures on 83 Programs in Botany

	Measure															
	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16
Program Size																
01		.42	.48	-.10	-.08	.04	.04	.56	.57	.36	.52	.31	-.04	.31	.55	.55
02			.55	-.14	.04	-.06	-.07	.29	.34	.11	.27	-.01	.03	.09	.23	.24
03				.04	.02	.21	.24	.51	.54	.09	.60	.29	.26	.17	.33	.32
Program Graduates																
04					-.07	-.18	.11	.31	.23	-.24	.25	.34	.54	.20	-.12	-.11
05						.25	.24	.26	.25	-.13	.21	.11	.12	.12	.04	.16
06							.58	.36	.32	-.07	.23	.24	-.03	.04	.24	.18
07								.59	.56	-.09	.51	.43	.50	.28	.24	.26
Survey Results																
08									.97	.29	.83	.66	.49	.62	.60	.62
09										.32	.80	.62	.45	.61	.61	.63
10											.24	.02	-.05	-.07	.26	.24
11												.54	.54	.48	.51	.56
University Library																
12													.34	.55	.40	.37
Research Support																
13														.36	-.02	.04
14															.47	.52
Publication Records																
15																.96
16																

NOTE: Since in computing correlation coefficients program data must be available for both of the measures being correlated, the actual number of programs on which each coefficient is based varies.

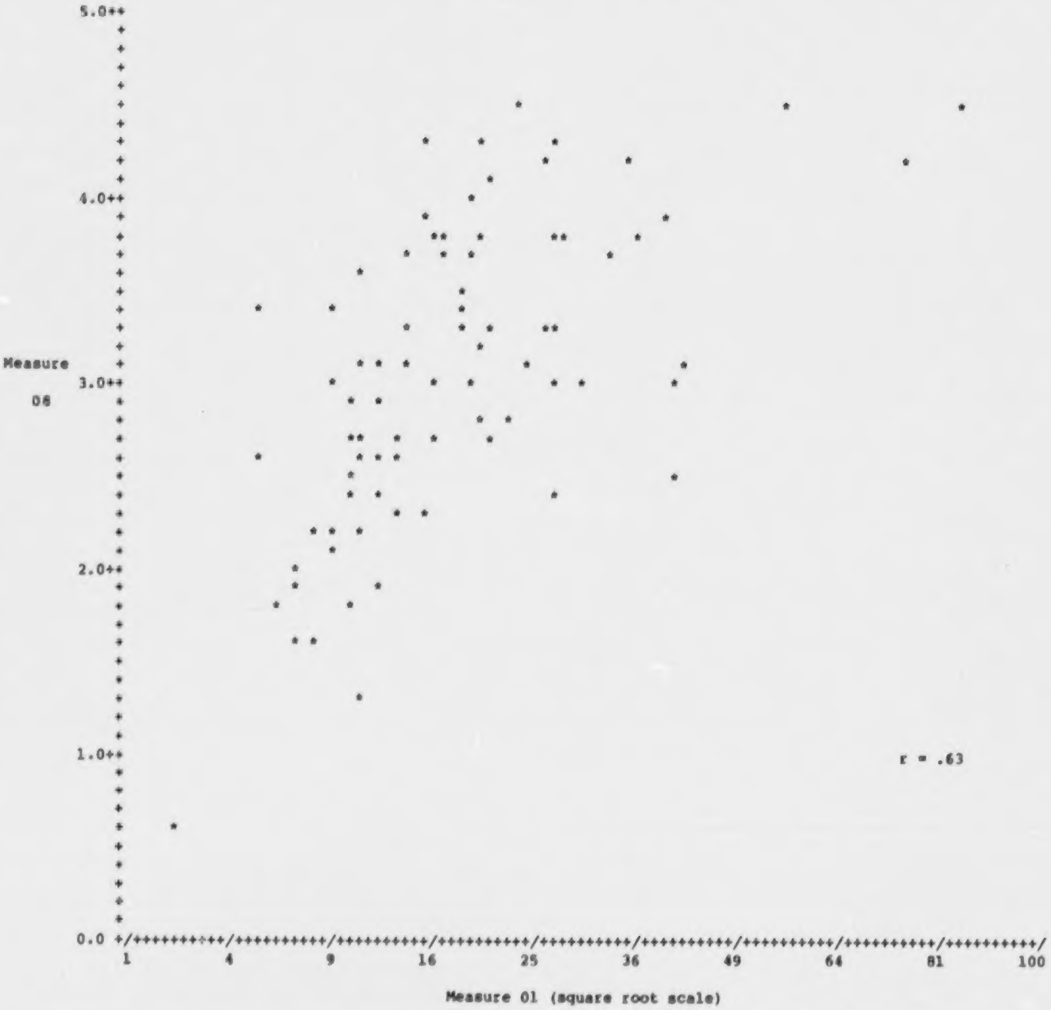

FIGURE 4.1 Mean rating of scholarly quality of faculty (measure 08) versus number of faculty members (measure 01)--83 programs in botany.

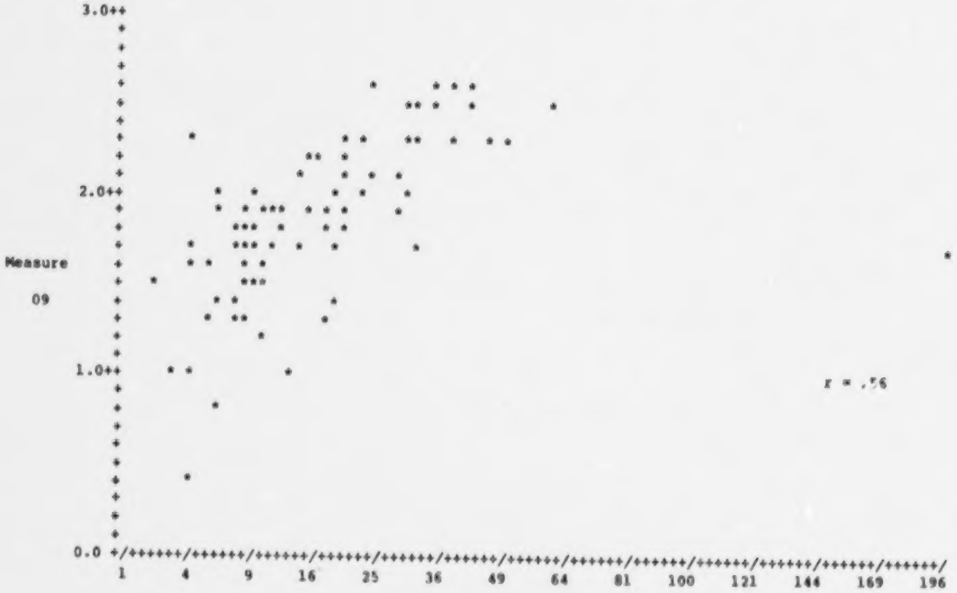

FIGURE 4.2 Mean rating of program effectiveness in educating research scholars/scientists (measure 09) versus number of graduates in last five years (measure 02)--82 programs in botany.

TABLE 4.4 Characteristics of Survey Participants in Botany

	Respondents	
	N	%
Field of Specialization		
Botany	45	29
Ecology	16	11
Plant Physiology	35	23
Phytopathology	35	23
Other/Unknown	22	14
Faculty Rank		
Professor	85	56
Associate Professor	51	33
Assistant Professor	16	11
Other/Unknown	1	1
Year of Highest Degree		
Pre-1950	9	6
1950-59	25	16
1960-69	79	52
Post-1969	39	26
Unknown	1	1
Evaluator Selection		
Nominated by Institution	131	86
Other	22	14
Survey Form		
With Faculty Names	136	89
Without Names	17	11
Total Evaluators	153	100

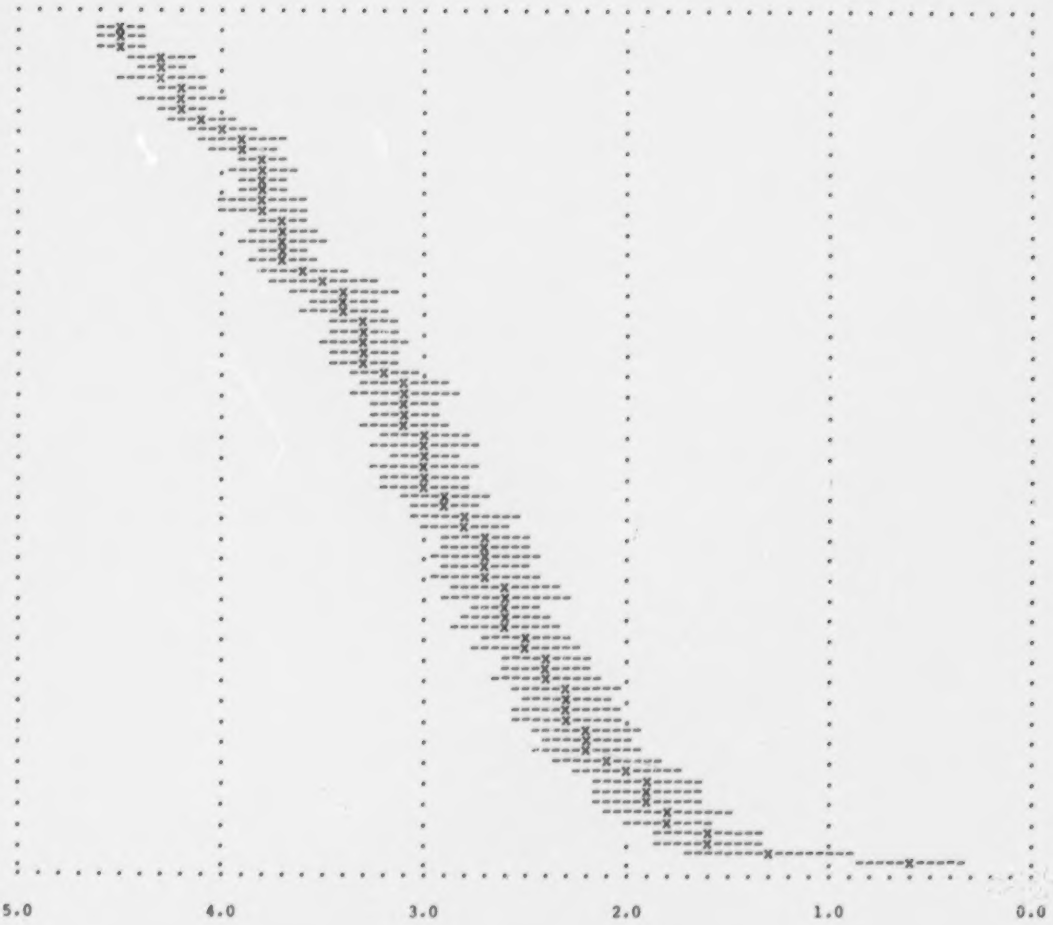

FIGURE 4.3 Mean rating of scholarly quality of faculty in 83 programs in botany.

NOTE: Programs are listed in sequence of mean rating, with the highest-rated program appearing at the top of the page. The broken lines (---) indicate a confidence interval of ±1.5 standard errors around the reported mean (x) of each program.

V

Cellular/Molecular Biology Programs

In this chapter 89 research-doctorate programs in cellular/molecular biology are assessed. These programs, according to the information supplied by their universities, have accounted for 1,871 doctoral degrees awarded during the FY1976-80 period.[1] Because cellular and molecular biology programs transcend the boundaries of many other biological science disciplines and because these programs may be found in a variety of different institutional settings (including biology departments, medical school departments, etc.), the committee encountered difficulty in identifying a comprehensive set of research-doctorate programs that have produced graduates in this discipline. On the average, 34 full-time and part-time students intending to earn doctorates were enrolled in a program in December 1980, with an average faculty size of 26 members.[2] Roughly half of the 89 programs, listed in Table 5.1, are located in departments of biology or biological sciences and one-fourth in departments of cellular or molecular biology. The remainder are in departments of anatomy, genetics, and other biological sciences. Eighteen programs were initiated since 1970. Each of six institutions--Florida State University, University of Pittsburgh, SUNY at Buffalo, Tufts University, University of Utah, and Washington University (St. Louis)--has two cellular/molecular biology programs included in the assessment. The Albert Einstein College of Medicine has three programs evaluated and the University of Chicago has four. In addition to the 78 institutions represented in this discipline, another 17 were initially identified as meeting the criteria[3] for inclusion in the assessment:

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[1] Data from the NRC's Survey of Earned Doctorates indicate that 199 research doctorates in cytology, 773 in molecular biology, and 952 in general biology were awarded by U.S. universities between FY1976 and FY1980. Since the NRC figure is based on field of degree and not department, it may exclude some doctorates included in the numbers reported by the institutional coordinators.

[2] See the reported means for measures 03 and 01 in Table 5.2.

[3] As mentioned in Chapter I, the primary criterion for inclusion was that a university had awarded at least 10 doctorates in cellular/molecular biology during the FY1976-78 period.

University of California--Davis
University of California--San Francisco
Colorado State University--Fort Collins
Cornell University--Ithaca
Dartmouth College
University of Florida--Gainesville
Fordham University
Idaho State University--Pocatello
Illinois Institute of Technology
University of Iowa--Iowa City
University of Kentucky
University of Louisville
University of Miami--Florida
University of New Mexico--Albuquerque
New York University
Saint John's University
College of William and Mary

Saint John's University chose not to participate in the assessment in any discipline. Cellular/molecular biology programs at the other 16 institutions have not been included in the evaluations in this discipline, since in each case the study coordinator either indicated that the institution did not at that time have a research-doctorate program in cellular/molecular biology or failed to provide the information requested by the committee.

Before examining the individual program results presented in Table 5.1, the reader is urged to refer to Chapter II, in which each of the 16 measures used in the assessment is discussed. Summary statistics describing every measure are given in Table 5.2. For eight of the measures, data are reported for at least 77 of the 89 cellular/molecular biology programs. For measures 04-07, which pertain to characteristics of the program graduates, data are presented for only approximately two-thirds of the programs; the other third had too few graduates on which to base statistics.[*] For measure 12, a composite index of the size of a university library, data are available for 63 programs; for measure 14, the total university expenditures for research in the biological sciences, data are available for 67 programs. The programs not evaluated on measures 12 and 14 are typically smaller--in terms of faculty size and graduate student enrollment--than other cellular/ molecular biology programs. Were data on these two measures available for all 89 programs, it is likely that their reported means would be appreciably lower (and that some of the correlations of these measures with others would be higher). With regard to reputational survey measures 09 and 10, results were not reported for any programs with fewer than 15 ratings.

Intercorrelations among the 16 measures (Pearson product-moment coefficients) are given in Table 5.3. Of particular note are the high positive correlations of the reputational survey ratings (08, 09) with measures of publication records (15, 16) and total research expenditures (14). Figure 5.1 illustrates the relation between the mean rating of the scholarly quality of faculty (measure 08) and the number of faculty members (measure 01) for each of 86 programs in cellular/molecular biology. Figure 5.2 plots the mean rating of program effectiveness (measure 09) against the total number of FY1976-80 program graduates (measure 02). Although in both figures there is a significant positive correlation between program size and reputational rating, it is quite apparent that many of the smaller programs received high mean ratings.

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[*] As mentioned in Chapter II, data for measures 04-07 are not reported if they are based on the survey responses of fewer than 10 FY1975-79 program graduates.

Table 5.4 describes the 139 faculty members who participated in the evaluation of cellular/molecular biology programs. These individuals constituted 52 percent of those asked to respond to the survey in this discipline and 6 percent of the faculty population in the 89 research-doctorate programs being evaluated.[5] Approximately two-thirds of the evaluators identified themselves as cellular or molecular biologists, with the remainder split among biochemistry, genetics, and other biological science disciplines. A majority of the survey participants had earned their highest degree prior to 1970, and almost half held the rank of full professor.

One exception should be noted with regard to the survey evaluations in this discipline. In the program listing on the survey form, New Mexico State University at Las Cruces was identified as being located in Alamogordo, where there is another branch of the same university system not offering the research doctorate. Since a large majority of faculty evaluators indicated that they were unfamiliar with this program and it is quite possible that some of them were misled by the inaccurate identification of this institution, the committee has decided not to report the survey results for this program.

To assist the reader in interpreting results of the survey evaluations, estimated standard errors have been computed for mean ratings of the scholarly quality of faculty in 86 cellular/molecular biology programs (and are given in Table 5.1). For each program the mean rating and an associated "confidence interval" of 1.5 standard errors are illustrated in Figure 5.3 (listed in order of highest to lowest mean rating). In comparing two programs, if their confidence intervals do not overlap, one may conclude that there is a significant difference in their mean ratings at a .05 level of significance.[6] From this figure it is also apparent that one should have somewhat more confidence in the accuracy of the mean ratings of higher-rated programs than lower-rated programs. This generalization results primarily from the fact that evaluators are not as likely to be familiar with the less prestigious programs, and consequently the mean ratings of these programs are usually based on fewer survey responses.

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[5] See Table 2.3 in Chapter II.

[6] See pp. 31-33 for a discussion of the interpretation of mean ratings and associated confidence intervals.

TABLE 5.1 Program Measures (Raw and Standardized Values) in Cellular/Molecular Biol.

Prog No.	University - Department/Academic Unit	Program Size (01)	(02)	(03)	Characteristics of Program Graduates (04)	(05)	(06)	(07)
001.	Albert Einstein College of Medicine	8	2	11	NA	NA	NA	NA
	Anatomy	*42*	*40*	*43*				
002.	Albert Einstein College of Medicine	18	10	19	.80	NA	NA	NA
	Cell Biology	*47*	*44*	*45*	*58*			
003.	Albert Einstein College of Medicine	8	11	16	NA	NA	NA	NA
	Molecular Biology	*42*	*44*	*44*				
004.	Arizona, University of-Tucson	11	1	10	NA	NA	NA	NA
	*Cellular and Developmental Biology**	*43*	*40*	*43*				
005.	Atlanta University	10	29	26	.83	6.0	.83	.17
	Biology	*43*	*53*	*48*	*59*	*52*	*53*	*24*
006.	Baylor College of Medicine-Houston	30	21	30	.46	5.3	.85	.54
	*Cell Biology**	*52*	*49*	*49*	*45*	*61*	*54*	*48*
007.	Boston University	18	18	35	.27	7.3	.46	.27
	Biology	*47*	*48*	*50*	*38*	*34*	*18*	*31*
008.	Bowling Green State University	29	18	32	.31	7.0	.60	.07
	Biological Sciences	*52*	*48*	*49*	*39*	*38*	*32*	*17*
009.	Brandeis University	16	19	44	.69	6.1	.88	.69
	Biology	*46*	*48*	*53*	*54*	*50*	*57*	*58*
010.	Brown University	24	18	25	.67	6.0	.88	.69
	Biology and Medicine	*49*	*48*	*47*	*53*	*52*	*57*	*58*
011.	CUNY-Graduate School	111	85	114	.25	8.5	.77	.43
	Biology	*89*	*80*	*75*	*37*	*18*	*47*	*41*
012.	California, University of-Irvine	26	16	43	.60	4.5	.87	.67
	Molec & Biochem/Biol Chem/Dev & Cell/Micro	*50*	*47*	*53*	*50*	*72*	*56*	*57*
013.	California Institute of Technology	23	48	47	.81	6.1	.90	.63
	Biology	*49*	*62*	*54*	*58*	*50*	*59*	*55*
014.	California, University of-Berkeley	14	41	33	.77	5.7	.86	.57
	Molecular Biology	*45*	*59*	*50*	*57*	*56*	*55*	*50*
015.	California, University of-Los Angeles	42	27	35	.69	5.4	.74	.58
	Molecular Biology	*58*	*52*	*50*	*54*	*60*	*45*	*51*
016.	California, University of-Riverside	21	21	19	.40	7.8	.80	.50
	Biology	*48*	*49*	*45*	*43*	*28*	*50*	*46*
017.	California, University of-San Diego	46	74	50	.91	6.2	.83	.73
	Biology	*59*	*74*	*55*	*62*	*49*	*53*	*61*
018.	California, University of-Santa Barbara	49	75	98	.18	6.8	.70	.30
	Biological Sciences	*61*	*75*	*70*	*34*	*41*	*41*	*33*
019.	Case Western Reserve University	33	3	24	NA	NA	NA	NA
	*Anatomy/Biochem/Biol/Micro/Pathol/Physiol**	*53*	*41*	*47*				
020.	Chicago, University of	8	18	14	NA	NA	NA	NA
	Biology	*42*	*48*	*44*				

* indicates program was initiated since 1970.

NOTE: On the first line of data for every program, raw values for each measure are reported; on the second line values are reported in standardized form, with mean = 50 and standard deviation = 10. "NA" indicates that the value for a measure is not available.

TABLE 5.1 Program Measures (Raw and Standardized Values) in Cellular/Molecular Biol.

Prog	Survey Results				University Library	Research Support		Published Articles		Survey Ratings Standard Error			
No.	(08)	(09)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(08)	(09)	(10)	(11)
001.	2.8	1.3	1.5	0.7	NA	NA	9184	234		.17	.17	.16	.08
	49	*36*	*62*	*49*			*48*	*58*	*61*				
002.	3.5	2.0	1.0	1.0	NA	.78	9184	234		.10	.07	.08	.08
	56	*53*	*42*	*56*		*56*	*48*	*58*	*61*				
003.	2.9	1.7	1.1	0.7	NA	NA	9184	234		.15	.12	.15	.09
	50	*45*	*46*	*50*			*48*	*58*	*61*				
004.	2.0	1.1	1.2	0.4	0.9	.55	7828	82		.17	.16	.18	.07
	40	*30*	*49*	*42*	*56*	*46*	*46*	*46*	*45*				
005.	NA	NA	NA	0.1	NA	.30	NA	5		NA	NA	NA	.04
				36		*35*		*40*	*40*				
006.	3.6	2.1	1.5	1.1	NA	.77	14051	225		.09	.06	.08	.08
	57	*56*	*62*	*59*		*56*	*56*	*57*	*57*				
007.	2.6	1.4	0.9	0.4	-0.4	.50	NA	26		.15	.13	.11	.07
	46	*38*	*36*	*43*	*44*	*44*		*42*	*41*				
008.	1.5	NA	NA	0.1	NA	.21	NA	17		.26	NA	NA	.04
	35			*36*		*31*		*41*	*41*				
009.	3.6	2.2	1.1	1.2	NA	.88	5487	98		.10	.08	.09	.08
	57	*59*	*44*	*60*		*61*	*43*	*47*	*49*				
010.	3.1	1.9	1.2	0.9	-1.1	.63	NA	75		.10	.06	.10	.08
	52	*50*	*51*	*53*	*37*	*49*		*45*	*45*				
011.	2.4	1.5	1.0	0.4	NA	.24	NA	74		.18	.23	.17	.07
	44	*41*	*41*	*42*		*32*		*45*	*44*				
012.	3.2	1.9	1.2	0.9	NA	.85	6547	144		.11	.09	.11	.08
	53	*51*	*51*	*55*		*59*	*44*	*51*	*50*				
013.	4.8	2.8	1.1	1.6	NA	.91	5446	187		.05	.06	.08	.07
	70	*72*	*47*	*71*		*62*	*43*	*54*	*55*				
014.	4.2	2.3	1.2	1.5	2.2	.86	18977	387		.08	.07	.10	.07
	64	*61*	*48*	*68*	*69*	*60*	*63*	*70*	*68*				
015.	3.8	2.2	1.6	1.2	2.0	.86	15581	444		.09	.07	.08	.07
	60	*57*	*66*	*62*	*67*	*60*	*58*	*74*	*72*				
016.	2.6	1.6	1.1	0.4	-1.0	.38	6232	96		.18	.12	.13	.06
	47	*42*	*44*	*42*	*38*	*38*	*44*	*47*	*46*				
017.	4.3	2.5	1.5	1.4	-0.0	.74	8706	304		.08	.07	.10	.08
	64	*66*	*60*	*66*	*47*	*54*	*48*	*63*	*63*				
018.	3.2	2.0	1.1	0.7	-0.1	.59	NA	86		.10	.08	.14	.07
	52	*52*	*46*	*50*	*47*	*48*		*46*	*47*				
019.	2.7	1.5	0.8	0.5	-1.3	.70	772	143		.17	.16	.14	.07
	47	*40*	*31*	*44*	*35*	*53*	*46*	*51*	*51*				
020.	3.4	1.9	1.0	0.9	0.9	NA	17589	325		.11	.08	.11	.09
	55	*51*	*41*	*53*	*56*		*61*	*65*	*64*				

NOTE: On the first line of data for every program, raw values for each measure are reported; on the second line values are reported in standardized form, with mean = 50 and standard deviation = 10. "NA" indicates that the value for a measure is not available. Since the scale used to compute measure 16 is entirely arbitrary, only values in standardized form are reported for this measure.

TABLE 5.1 Program Measures (Raw and Standardized Values) in Cellular/Molecular Biol.

Prog No.	University - Department/Academic Unit	Program Size (01)	(02)	(03)	Characteristics of Program Graduates (04)	(05)	(06)	(07)
021.	Chicago, University of	15	35	28	NA	NA	NA	NA
	Biophysics and Theoretical Biology	*45*	*56*	*48*				
022.	Chicago, University of	18	1	11	NA	NA	NA	NA
	*Developmental Biology**	*47*	*40*	*43*				
023.	Chicago, University of	33	11	11	1.00	6.3	.83	.75
	Genetics	*53*	*44*	*43*	*66*	*48*	*53*	*62*
024.	Cincinnati, University of	9	10	4	.10	5.2	.80	.70
	Biological Sciences	*42*	*44*	*41*	*31*	*63*	*50*	*59*
025.	Colorado, University of	22	24	57	.68	5.8	.84	.72
	Molecular, Cellular, and Developmental Biol	*48*	*51*	*57*	*53*	*54*	*54*	*60*
026.	Columbia University	26	27	61	.75	6.3	.90	.62
	Biological Sciences	*50*	*52*	*58*	*56*	*48*	*59*	*54*
027.	Connecticut, University of-Storrs	15	9	19	.85	6.7	.77	.54
	Biological Sciences	*45*	*43*	*45*	*60*	*42*	*47*	*48*
028.	Cornell University-Medical Center	17	24	39	.42	5.4	1.00	.58
	Biological Structure/Cell Biology	*46*	*51*	*52*	*43*	*60*	*69*	*51*
029.	Delaware, University of-Newark	8	5	5	NA	NA	NA	NA
	Life and Health Sciences	*42*	*41*	*41*				
030.	Duke University	134	NA	32	.73	6.1	.66	.55
	*Cell and Molecular Biology**	*99*		*49*	*55*	*50*	*37*	*49*
031.	Florida State University-Tallahassee	36	63	64	.46	6.9	.75	.37
	Biological Science	*55*	*69*	*59*	*45*	*40*	*46*	*37*
032.	Florida State University-Tallahassee	22	17	9	.57	5.5	.89	.51
	*Molecular Biophysics**	*48*	*47*	*42*	*49*	*59*	*59*	*47*
033.	Harvard University	19	35	53	.89	5.7	.92	.58
	Biology (Cellular & Developmental)	*47*	*56*	*56*	*62*	*56*	*61*	*51*
034.	Houston, University of	12	7	6	NA	NA	NA	NA
	Biology	*44*	*42*	*41*				
035.	Illinois, University-Urbana/Champaign	40	NA	9	.60	6.2	.80	.56
	Cell Biology	*57*		*42*	*50*	*49*	*50*	*50*
036.	Indiana University-Bloomington	18	9	33	.78	5.9	.91	.61
	*Biology**	*47*	*43*	*50*	*57*	*53*	*61*	*53*
037.	Iowa State University-Ames	24	11	25	NA	NA	NA	NA
	Molecular, Cellular, and Developmental Biol	*49*	*44*	*47*				
038.	Johns Hopkins University	12	60	79	.96	6.3	.91	.65
	Biology	*44*	*68*	*64*	*64*	*47*	*61*	*56*
039.	Kansas, University of	10	12	7	.22	6.5	.77	.53
	Physiology and Cell Biology	*43*	*45*	*42*	*36*	*45*	*47*	*48*
040.	Loma Linda University	6	NA	4	NA	NA	NA	NA
	Biology	*41*		*41*				

* indicates program was initiated since 1970.

NOTE: On the first line of data for every program, raw values for each measure are reported; on the second line values are reported in standardized form, with mean = 50 and standard deviation = 10. "NA" indicates that the value for a measure is not available.

TABLE 5.1 Program Measures (Raw and Standardized Values) in Cellular/Molecular Biol.

Prog	Survey Results				University Library	Research Support		Published Articles		Survey Ratings Standard Error			
No.	(08)	(09)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(08)	(09)	(10)	(11)
021.	3.7	2.3	1.0	0.8	0.9	.67	17589	325		.11	.09	.11	.08
	58	*59*	*42*	*51*	*56*	*51*	*61*	*65*	*64*				
022.	3.4	1.8	0.8	1.0	0.9	.78	17589	325		.10	.12	.11	.07
	54	*47*	*33*	*57*	*56*	*56*	*61*	*65*	*64*				
023.	3.9	2.2	1.3	1.1	0.9	.76	17589	325		.10	.08	.10	.09
	61	*57*	*52*	*58*	*56*	*55*	*61*	*65*	*64*				
024.	1.7	NA	NA	0.3	-0.2	NA	9365	14		.19	NA	NA	.07
	37			*40*	*45*		*49*	*41*	*41*				
025.	4.1	2.4	1.5	1.5	-0.9	.91	11967	125		.09	.07	.07	.07
	62	*63*	*64*	*67*	*39*	*62*	*53*	*49*	*49*				
026.	4.1	2.4	1.4	1.4	1.7	.89	11090	94		.08	.07	.10	.08
	63	*62*	*59*	*65*	*65*	*61*	*51*	*47*	*48*				
027.	2.7	1.6	1.0	0.7	-0.5	.53	15199	56		.11	.10	.13	.09
	48	*42*	*41*	*50*	*43*	*45*	*58*	*44*	*43*				
028.	3.2	1.9	1.1	0.6	NA	.18	14597	102		.15	.14	.14	.08
	52	*50*	*45*	*46*		*29*	*57*	*48*	*49*				
029.	2.0	1.4	0.9	0.3	NA	NA	NA	39		.19	.13	.13	.06
	40	*38*	*36*	*40*				*43*	*43*				
030.	3.7	2.1	1.5	1.0	0.3	.69	11320	203		.09	.08	.09	.08
	58	*57*	*61*	*57*	*51*	*52*	*52*	*56*	*57*				
031.	2.8	1.9	1.2	0.4	-0.4	.81	3196	42		.15	.13	.14	.07
	48	*51*	*51*	*43*	*43*	*57*	*39*	*43*	*42*				
032.	2.7	1.8	NA	0.5	-0.4	.91	3196	42		.17	.10	NA	.07
	48	*47*		*45*	*43*	*62*	*39*	*43*	*42*				
033.	4.3	2.6	0.9	1.5	3.0	.90	34979	281		.07	.06	.07	.08
	65	*67*	*36*	*67*	*77*	*61*	*88*	*62*	*64*				
034.	1.4	NA	NA	0.3	-0.9	.42	NA	44		.21	NA	NA	.05
	34			*39*	*39*	*40*		*43*	*42*				
035.	3.1	1.8	1.2	0.6	2.0	.73	6074	142		.13	.10	.13	.08
	52	*48*	*49*	*48*	*67*	*54*	*44*	*51*	*50*				
036.	3.5	2.0	1.3	1.1	0.9	.83	NA	119		.11	.09	.09	.09
	56	*53*	*55*	*58*	*57*	*59*		*49*	*48*				
037.	2.6	1.6	NA	0.4	-0.5	.58	5287	62		.15	.12	NA	.07
	46	*42*		*43*	*43*	*48*	*42*	*44*	*44*				
038.	3.3	2.0	0.8	1.0	-0.4	.83	19837	62		.09	.08	.10	.07
	54	*53*	*32*	*57*	*44*	*59*	*65*	*44*	*45*				
039.	1.9	1.2	0.9	0.3	0.1	.50	3161	51		.23	.18	.09	.06
	39	*32*	*36*	*41*	*49*	*44*	*39*	*44*	*43*				
040.	0.4	NA	NA	0.1	NA	NA	NA	0		.16	NA	NA	.03
	23			*35*				*39*	*40*				

NOTE: On the first line of data for every program, raw values for each measure are reported; on the second line values are reported in standardized form, with mean = 50 and standard deviation = 10. "NA" indicates that the value for a measure is not available. Since the scale used to compute measure 16 is entirely arbitrary, only values in standardized form are reported for this measure.

TABLE 5.1 Program Measures (Raw and Standardized Values) in Cellular/Molecular Biol.

Prog No.	University - Department/Academic Unit	Program Size			Characteristics of Program Graduates			
		(01)	(02)	(03)	(04)	(05)	(06)	(07)
041.	Marquette University	17	15	16	.40	6.2	NA	NA
	Biology	*46*	*46*	*44*	*43*	*49*		
042.	Massachusetts Institute of Technology	20	35	49	.88	5.2	.82	.61
	Biology	*47*	*56*	*55*	*61*	*62*	*52*	*53*
043.	Michigan State University-East Lansing	33	42	70	NA	NA	NA	NA
	Microbiology and Biochemistry	*53*	*59*	*61*				
044.	Michigan, University of-Ann Arbor	63	3	24	NA	NA	NA	NA
	Cellular and Molecular Biology	*67*	*41*	*47*				
045.	Minnesota, University of	21	9	18	NA	NA	NA	NA
	Genetics and Cell Biology	*48*	*43*	*45*				
046.	Missouri, University of-Columbia	11	2	10	NA	NA	NA	NA
	*Biological Sciences**	*43*	*40*	*43*				
047.	Nebraska, University of-Lincoln	12	15	23	NA	NA	NA	NA
	*Life Sciences**	*44*	*46*	*47*				
048.	New Mexico State University-Las Cruces	19	15	20	.29	6.0	.71	.43
	Biology	*47*	*46*	*46*	*38*	*52*	*42*	*41*
049.	North Carolina, University of-Chapel Hill	51	NA	NA	.55	4.7	1.00	.63
	Cellular Biology/Molecular Biology	*62*			*48*	*70*	*69*	*54*
050.	North Dakota, University of-Grand Forks	9	11	8	NA	NA	NA	NA
	Anatomy	*42*	*44*	*42*				
051.	North Texas State University-Denton	6	8	18	NA	NA	NA	NA
	*Biological Sciences**	*41*	*43*	*45*				
052.	Northwestern University	45	44	93	.46	5.5	.68	.64
	Biochem & Molec/Pharmacol/Anat/Path/Physiol	*59*	*60*	*68*	*45*	*59*	*39*	*55*
053.	Ohio State University-Columbus	11	9	6	NA	NA	NA	NA
	Molecular, Cellular, and Developmental Biol	*43*	*43*	*41*				
054.	Oregon, University of-Eugene	21	4	10	.69	6.7	.58	.42
	Biology	*48*	*41*	*43*	*54*	*43*	*30*	*40*
055.	Pennsylvania, University of	46	27	33	.85	5.9	.78	.56
	Molecular Biology	*59*	*52*	*50*	*60*	*53*	*48*	*50*
056.	Pittsburgh, University of	5	8	19	NA	NA	NA	NA
	Anatomy and Cell Biology (Schl of Medicine)	*41*	*43*	*45*				
057.	Pittsburgh, University of	28	8	26	.25	7.0	.56	.25
	*Biological Sciences (Arts and Sciences)**	*51*	*43*	*48*	*37*	*38*	*28*	*29*
058.	Princeton University	15	39	36	.77	6.2	.69	.62
	Biology	*45*	*58*	*51*	*57*	*49*	*40*	*53*
059.	Purdue University-West Lafayette	38	79	119	.68	6.1	.76	.54
	Biological Sciences	*56*	*77*	*76*	*54*	*51*	*46*	*48*
060.	Rensselaer Polytechnic Institute	10	9	6	NA	NA	NA	NA
	Biology	*43*	*43*	*41*				

* indicates program was initiated since 1970.

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TABLE 5.1 Program Measures (Raw and Standardized Values) in Cellular/Molecular Biol.

Prog No.	Survey Results (08)	(09)	(10)	(11)	University Library (12)	Research Support (13)	(14)	Published Articles (15)	(16)	Survey Ratings Standard Error (08)	(09)	(10)	(11)
041.	1.8	NA	NA	0.2	NA	.35	NA	5		.18	NA	NA	.05
	38			*37*		*37*		*40*	*40*				
042.	4.9	2.8	1.3	1.7	-0.3	.85	17348	360		.04	.05	.07	.06
	70	*74*	*56*	*72*	*44*	*59*	*61*	*68*	*72*				
043.	2.7	1.7	1.3	0.8	0.3	.70	10357	145		.13	.09	.14	.09
	48	*45*	*53*	*51*	*51*	*53*	*50*	*51*	*49*				
044.	3.3	1.7	1.2	0.9	1.8	.14	15431	324		.11	.11	.12	.08
	54	*46*	*49*	*54*	*65*	*28*	*58*	*65*	*64*				
045.	2.8	1.7	1.0	0.6	1.2	.86	13696	309		.11	.10	.09	.07
	49	*45*	*39*	*47*	*59*	*60*	*55*	*64*	*60*				
046.	1.6	0.9	NA	0.3	-0.2	.64	4628	35		.21	.17	NA	.05
	36	*26*		*39*	*46*	*50*	*41*	*42*	*42*				
047.	2.1	1.6	NA	0.2	-0.5	.67	2965	44		.23	.18	NA	.06
	41	*42*		*39*	*43*	*51*	*39*	*43*	*43*				
048.	NA	NA	NA	NA	NA	.32	NA	20		NA	NA	NA	NA
						36		*41*	*42*				
049.	3.3	2.0	1.6	0.9	1.0	.73	9849	NA		.09	.05	.13	.08
	54	*54*	*67*	*55*	*57*	*54*	*49*		*NA*				
050.	1.0	NA	NA	0.1	NA	NA	NA	15		.28	NA	NA	.04
	30			*35*				*41*	*41*				
051.	1.3	1.1	NA	0.2	NA	NA	NA	9		.24	.17	NA	.06
	32	*29*		*39*				*40*	*41*				
052.	3.2	2.0	1.4	0.8	0.3	.89	4760	147		.11	.10	.13	.08
	53	*54*	*59*	*53*	*51*	*61*	*42*	*51*	*50*				
053.	2.1	1.5	1.1	0.4	0.9	.73	8330	91		.16	.15	.17	.07
	41	*40*	*44*	*42*	*56*	*54*	*47*	*47*	*46*				
054.	3.7	2.1	1.1	1.1	-0.9	.86	NA	87		.08	.07	.08	.08
	58	*56*	*46*	*60*	*38*	*60*		*46*	*47*				
055.	3.5	2.0	1.1	1.1	0.7	.61	23550	396		.11	.07	.11	.08
	56	*54*	*44*	*59*	*54*	*49*	*71*	*71*	*68*				
056.	2.0	NA	NA	0.2	0.1	NA	6462	89		.19	NA	NA	.05
	40			*36*	*48*		*44*	*47*	*46*				
057.	2.8	1.8	1.4	0.7	0.1	.75	6462	63		.10	.10	.14	.07
	49	*49*	*57*	*49*	*48*	*55*	*44*	*44*	*45*				
058.	3.3	2.0	0.8	1.1	0.9	.73	3574	98		.12	.08	.12	.08
	53	*53*	*32*	*58*	*56*	*54*	*40*	*47*	*47*				
059.	3.4	2.1	1.2	1.0	-0.5	.82	10337	226		.09	.07	.10	.08
	55	*55*	*49*	*57*	*42*	*58*	*50*	*57*	*56*				
060.	1.5	NA	NA	0.1	NA	.40	NA	20		.24	NA	NA	.04
	35			*36*		*39*		*41*	*41*				

NOTE: On the first line of data for every program, raw values for each measure are reported; on the second line values are reported in standardized form, with mean = 50 and standard deviation = 10. "NA" indicates that the value for a measure is not available. Since the scale used to compute measure 16 is entirely arbitrary, only values in standardized form are reported for this measure.

TABLE 5.1 Program Measures (Raw and Standardized Values) in Cellular/Molecular Biol.

Prog No.	University - Department/Academic Unit	Program Size			Characteristics of Program Graduates			
		(01)	(02)	(03)	(04)	(05)	(06)	(07)
061.	Rice University	13	16	16	.74	6.3	.68	.53
	Biology	44	47	44	56	47	39	48
062.	Rochester, University of	27	29	42	.86	7.0	.76	.38
	Biology, Radiation Biol & Biology Trng Prog	51	53	52	60	38	47	38
063.	Rockefeller University	42	19	41	.18	5.4	.82	.71
	Cellular Biology/Molecular Biology	58	48	52	34	60	52	59
064.	SUNY at Albany	16	NA	NA	.54	5.8	.77	.62
	Biological Sciences	46			48	54	47	53
065.	SUNY at Buffalo	17	13	36	NA	NA	NA	NA
	Biological Sciences (Div of Grad & Prof Ed)	46	45	51				
066.	SUNY at Buffalo	13	13	17	NA	NA	NA	NA
	Biology (Roswell Park Graduate Division)	44	45	45				
067.	SUNY at Stony Brook	26	21	29	.31	6.2	.94	.75
	Biology	50	49	48	39	49	63	62
068.	SUNY-Downstate Medical Center	18	10	23	.50	6.3	.91	.36
	Anatomy and Cell Biology/ Biophysics	47	44	47	46	48	60	37
069.	Southern California, University of	37	28	114	.38	6.4	.81	.52
	Biological Sciences	55	52	75	42	47	51	47
070.	Southern Mississippi, Univ of-Hattiesburg	3	3	1	NA	NA	NA	NA
	Biology	40	41	40				
071.	Stanford University	7	NA	2	NA	NA	NA	NA
	*Structural Biology**	41		40				
072.	Syracuse University	10	15	10	.30	NA	.80	.70
	*Biology**	43	46	43	39		50	59
073.	Texas Woman's University-Denton	10	11	18	.00	5.5	.70	.50
	*Biology**	43	44	45	27	58	41	46
074.	Texas, U of-Health Science Center, Houston	21	18	26	.54	6.6	.77	.62
	Cellular and Molec Bio (M D Anderson Hosp)	48	48	48	48	43	47	53
075.	Texas, University of-Austin	29	32	11	.79	6.5	.64	.50
	*Biological Sciences**	52	54	43	58	45	36	46
076.	Texas, University of-Dallas	12	17	37	.11	5.5	.79	.74
	*Biology**	44	47	51	31	58	49	61
077.	Tufts University	15	10	13	NA	NA	NA	NA
	Biology	45	44	43				
078.	Tufts University	9	13	18	1.00	6.7	.92	.77
	Molecular Biology	42	45	45	66	42	61	63
079.	Tulane University	19	26	36	.42	7.8	.80	.50
	Biology	47	52	51	43	28	50	46
080.	Utah, University of-Salt Lake City	51	23	62	NA	NA	NA	NA
	Biology	62	50	59				

* indicates program was initiated since 1970.

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TABLE 5.1 Program Measures (Raw and Standardized Values) in Cellular/Molecular Biol.

Prog No.	Survey Results				University Library	Research Support		Published Articles		Survey Ratings Standard Error			
	(08)	(09)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(08)	(09)	(10)	(11)
061.	2.7	1.6	1.0	0.4	-1.4	.46	NA	50		.16	.16	.17	.06
	47	*42*	*41*	*42*	*33*	*42*		*43*	*45*				
062.	3.0	1.9	1.4	0.7	-0.6	.74	15969	233		.10	.11	.11	.08
	51	*51*	*57*	*50*	*41*	*55*	*59*	*58*	*55*				
063.	4.8	2.6	1.3	1.7	NA	.81	27299	252		.05	.07	.08	.06
	70	*67*	*53*	*72*		*58*	*76*	*59*	*64*				
064.	2.7	1.5	1.5	0.6	-1.0	.75	NA	72		.10	.12	.14	.08
	48	*40*	*61*	*47*	*38*	*55*		*45*	*46*				
065.	2.6	1.6	NA	0.5	0.3	.59	6799	43		.12	.14	NA	.06
	47	*42*		*44*	*50*	*48*	*45*	*43*	*42*				
066.	2.8	1.7	1.1	0.7	0.3	.00	6799	43		.13	.12	.10	.07
	49	*45*	*45*	*48*	*50*	*21*	*45*	*43*	*42*				
067.	2.9	1.8	1.4	0.7	-0.6	.62	5802	149		.10	.09	.10	.07
	50	*47*	*58*	*50*	*41*	*49*	*43*	*51*	*52*				
068.	2.5	1.6	1.5	0.4	NA	.39	3077	78		.15	.14	.14	.07
	45	*42*	*64*	*43*		*39*	*39*	*46*	*44*				
069.	2.8	1.6	1.2	0.4	0.4	.35	2405	48		.18	.16	.13	.07
	49	*44*	*51*	*43*	*51*	*37*	*38*	*43*	*44*				
070.	0.2	NA	NA	0.0	NA	NA	NA	24		.09	NA	NA	.02
	21			*34*				*41*	*41*				
071.	4.0	2.3	1.6	1.1	2.0	NA	12514	243		.10	.11	.10	.09
	61	*60*	*67*	*58*	*68*		*54*	*59*	*62*				
072.	2.3	1.5	0.8	0.4	-0.3	.70	NA	45		.18	.11	.13	.07
	43	*40*	*33*	*41*	*44*	*53*		*43*	*43*				
073.	NA	NA	NA	0.1	NA	.10	NA	6		NA	NA	NA	.04
				36		*26*		*40*	*40*				
074.	2.8	1.6	1.3	0.7	NA	.76	4151	NA		.13	.13	.15	.07
	48	*43*	*54*	*49*		*56*	*41*		*NA*				
075.	3.0	1.6	1.1	0.6	1.6	.79	5757	143		.14	.11	.16	.07
	51	*43*	*46*	*47*	*64*	*57*	*43*	*51*	*49*				
076.	2.3	1.5	1.1	0.5	NA	.50	NA	NA		.16	.16	.12	.07
	44	*41*	*43*	*44*		*44*			*NA*				
077.	1.6	NA	NA	0.2	NA	.40	3518	9		.18	NA	NA	.06
	36			*38*		*39*	*40*	*40*	*41*				
078.	2.8	1.9	1.2	0.6	NA	NA	3518	86		.15	.11	.13	.08
	48	*49*	*49*	*46*			*40*	*46*	*47*				
079.	2.3	NA	NA	0.3	-1.0	.16	3690	6		.15	NA	NA	.07
	44			*40*	*37*	*29*	*40*	*40*	*41*				
080.	3.5	2.0	1.8	0.9	-0.6	.61	6905	60		.10	.08	.07	.08
	56	*52*	*74*	*54*	*42*	*49*	*45*	*44*	*45*				

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TABLE 5.1 Program Measures (Raw and Standardized Values) in Cellular/Molecular Biol.

Prog No.	University - Department/Academic Unit	Program Size			Characteristics of Program Graduates			
		(01)	(02)	(03)	(04)	(05)	(06)	(07)
081.	Utah, University of-Salt Lake City	10	11	12	NA	NA	NA	NA
	Cellular, Viral, and Molecular Biology	*43*	*44*	*43*				
082.	Vanderbilt University	13	21	26	.60	5.4	.86	.71
	Molecular Biology	*44*	*49*	*48*	*50*	*60*	*55*	*60*
083.	Virginia, University of	20	22	49	.85	6.3	.70	.55
	Biology	*47*	*50*	*55*	*60*	*48*	*41*	*49*
084.	Washington University-Saint Louis	53	19	57	.82	6.0	.82	.82
	*Biology and Biomed Sci (Molecular Biology)**	*63*	*48*	*57*	*59*	*52*	*52*	*67*
085.	Washington University-Saint Louis	82	9	39	NA	NA	NA	NA
	Biology and Biomedical Sci (Cell Biology	*76*	*43*	*52*				
086.	Washington, University of-Seattle	17	28	8	.96	5.0	.96	.74
	Genetics	*46*	*52*	*42*	*64*	*66*	*65*	*62*
087.	Wayne State University	16	NA	NA	NA	NA	NA	NA
	Biological Sciences	*46*						
088.	Wisconsin, University of-Madison	67	27	91	.71	6.5	.87	.68
	Molecular Biology	*69*	*52*	*68*	*55*	*45*	*57*	*57*
089.	Yale University	76	120	205	.86	5.4	.92	.65
	Biol/Cell Bio/Molec Biophys & Biochem/Genet	*73*	*97*	*99*	*60*	*59*	*62*	*55*

* indicates program was initiated since 1970.

NOTE: On the first line of data for every program, raw values for each measure are reported; on the second line values are reported in standardized form, with mean = 50 and standard deviation = 10. "NA" indicates that the value for a measure is not available.

TABLE 5.1 Program Measures (Raw and Standardized Values) in Cellular/Molecular Biol.

Prog No.	Survey Results				University Library	Research Support		Published Articles		Survey Ratings Standard Error			
	(08)	(09)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(08)	(09)	(10)	(11)
081.	2.9	1.9	1.5	0.7	-0.6	.70	6905	50		.15	.10	.12	.09
	50	*50*	*64*	*48*	*42*	*53*	*45*	*43*	*43*				
082.	2.8	1.7	1.0	0.8	-0.7	.77	5204	25		.11	.09	.11	.08
	48	*46*	*43*	*52*	*41*	*56*	*42*	*41*	*43*				
083.	3.1	2.0	1.6	0.9	0.7	.85	6224	50		.12	.06	.10	.09
	52	*52*	*66*	*53*	*55*	*59*	*44*	*43*	*43*				
084.	3.8	2.2	1.4	1.2	-0.4	.85	16825	48		.08	.09	.08	.08
	60	*57*	*58*	*62*	*44*	*59*	*60*	*43*	*46*				
085.	3.7	2.1	1.3	1.1	-0.4	.73	16825	NA		.10	.10	.13	.08
	58	*54*	*52*	*59*	*44*	*54*	*60*		*NA*				
086.	4.0	2.5	1.2	1.0	1.5	.82	14164	85		.11	.08	.08	.09
	61	*64*	*48*	*55*	*62*	*58*	*56*	*46*	*45*				
087.	2.0	NA	NA	0.3	-0.4	.50	6372	48		.18	NA	NA	.06
	40			*40*	*44*	*44*	*44*	*43*	*43*				
088.	4.6	2.6	1.4	1.5	1.6	.79	19738	561		.07	.06	.07	.07
	67	*66*	*58*	*67*	*63*	*57*	*65*	*84*	*82*				
089.	4.7	2.7	1.4	1.7	2.1	.78	4337	511		.07	.07	.08	.06
	69	*70*	*59*	*72*	*68*	*56*	*41*	*80*	*84*				

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TABLE 5.2 Summary Statistics Describing Each Program Measure--Cellular/Molecular Biology

Measure	Number of Programs Evaluated	Mean	Standard Deviation	DECILES 1	2	3	4	5	6	7	8	9
Program Size												
01 Raw Value	89	26	22	8	10	13	16	18	21	26	36	49
Std Value	89	50	10	42	43	44	46	47	48	50	55	61
02 Raw Value	82	23	21	4	9	11	13	17	19	25	29	44
Std Value	82	50	10	41	43	44	45	47	48	51	53	60
03 Raw Value	86	34	32	7	10	16	19	25	32	36	49	66
Std Value	86	50	10	42	43	44	45	47	49	51	55	60
Program Graduates												
04 Raw Value	59	.59	.26	.22	.31	.42	.54	.63	.70	.78	.84	.88
Std Value	59	50	10	36	39	43	48	52	54	57	60	61
05 Raw Value	57	6.1	.7	7.0	6.7	6.4	6.3	6.2	6.0	5.8	5.5	5.4
Std Value	57	50	10	38	42	46	48	49	52	54	59	60
06 Raw Value	57	.80	.11	.65	.70	.76	.78	.80	.83	.86	.90	.92
Std Value	57	50	10	36	41	46	48	50	53	55	59	61
07 Raw Value	57	.56	.15	.35	.46	.52	.55	.58	.62	.65	.70	.73
Std Value	57	50	10	36	43	47	49	51	54	56	59	61
Survey Results												
08 Raw Value	86	2.9	1.0	1.6	2.1	2.6	2.8	2.9	3.2	3.4	3.7	4.1
Std Value	86	50	10	36	41	47	49	50	53	55	58	62
09 Raw Value	74	1.9	.4	1.4	1.6	1.6	1.8	1.9	2.0	2.0	2.2	2.4
Std Value	74	50	10	38	43	43	48	51	53	53	58	63
10 Raw Value	68	1.2	.2	.9	1.0	1.1	1.1	1.2	1.3	1.4	1.4	1.5
Std Value	68	50	10	37	41	45	45	50	54	58	58	63
11 Raw Value	88	.7	.4	.2	.3	.4	.6	.7	.8	1.0	1.1	1.4
Std Value	88	50	10	38	40	42	47	49	52	56	59	66
University Library												
12 Raw Value	63	.3	1.0	-1.0	-.6	-.5	-.4	.0	.3	.9	1.0	1.8
Std Value	63	50	10	38	42	43	44	48	50	56	57	65
Research Support												
13 Raw Value	77	.64	.22	.28	.41	.55	.63	.71	.75	.78	.83	.86
Std Value	77	50	10	34	40	46	50	53	55	56	59	60
14 Raw Value	67	10243	6479	3421	4681	5829	6530	8079	9947	13578	15814	17589
Std Value	67	50	10	39	41	43	44	47	50	55	59	61
Publication Records												
15 Raw Value	85	133	127	15	39	48	62	86	98	146	234	325
Std Value	85	50	10	41	43	43	44	46	47	51	58	65
16 Std Value	85	50	10	41	42	43	45	46	48	51	61	64

NOTE: Standardized values reported in the preceding table have been computed from exact values of the mean and standard deviation and not the rounded values reported here. Since the scale used to compute measure 16 is entirely arbitrary, only data in standardized form are reported for this measure.

TABLE 5.3 Intercorrelations Among Program Measures on 89 Programs in Cellular/Molecular Biology

	Measure															
	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16
Program Size																
01		.54	.55	.03	-.16	-.09	-.01	.39	.29	.28	.37	.16	.06	.16	.37	.37
02			.83	.16	-.11	.12	-.02	.42	.47	.09	.40	.19	.18	.02	.32	.34
03				.07	-.06	.12	.02	.43	.39	.20	.43	.12	.16	.02	.32	.35
Program Graduates																
04					.13	.32	.29	.58	.51	.10	.54	.34	.55	.30	.42	.42
05						.44	.48	.38	.42	.31	.37	.36	.39	.25	.26	.29
06							.57	.33	.34	.16	.32	.26	.18	.18	.23	.26
07								.41	.35	.10	.48	.13	.48	.20	.29	.32
Survey Results																
08									.96	.33	.94	.47	.58	.57	.69	.71
09										.33	.91	.37	.51	.47	.56	.61
10											.31	.06	.19	-.16	.15	.17
11												.45	.65	.58	.70	.74
University Library																
12													.24	.42	.59	.59
Research Support																
13														.24	.40	.40
14															.58	.59
Publication Records																
15																.99
16																

NOTE: Since in computing correlation coefficients program data must be available for both of the measures being correlated, the actual number of programs on which each coefficient is based varies.

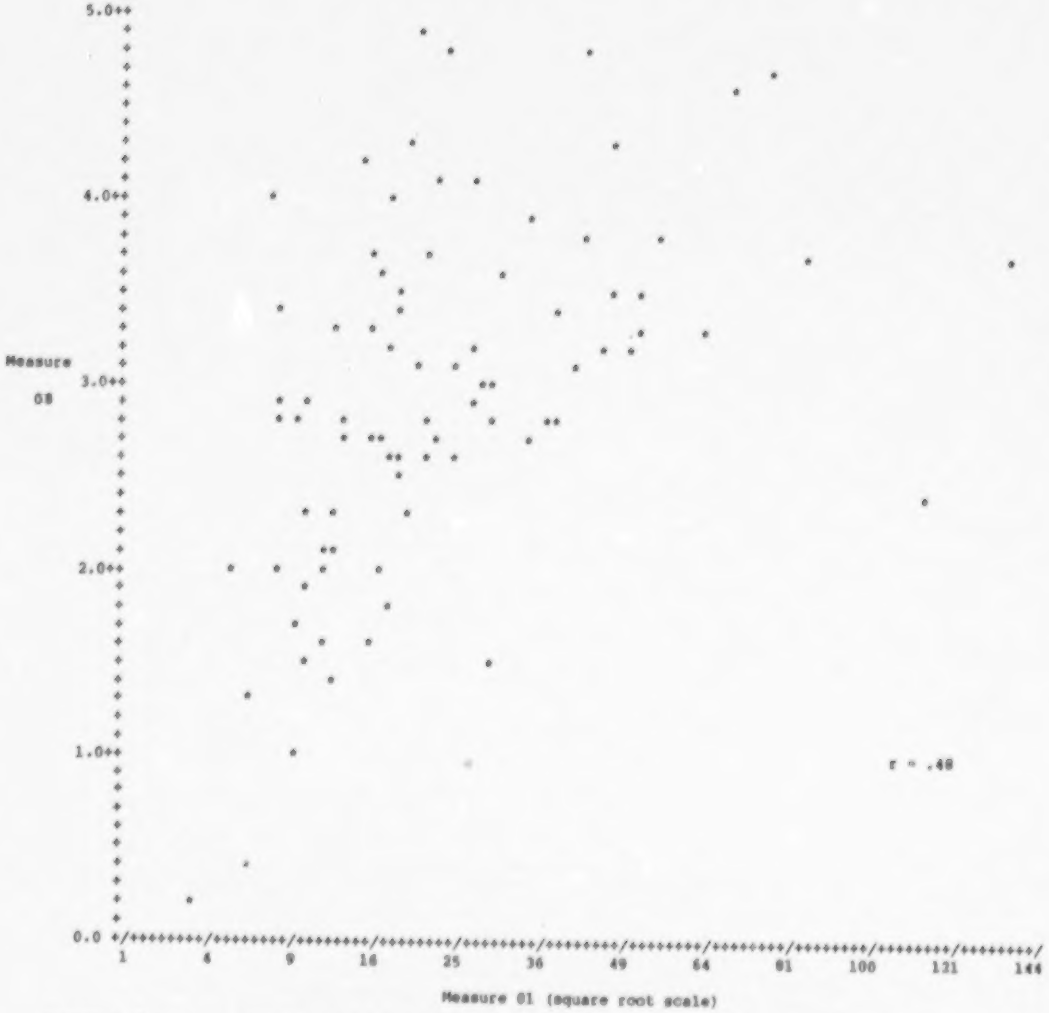


FIGURE 5.1 Mean rating of scholarly quality of faculty (measure 08) versus number of faculty members (measure 01)--86 programs in cellular/molecular biology.

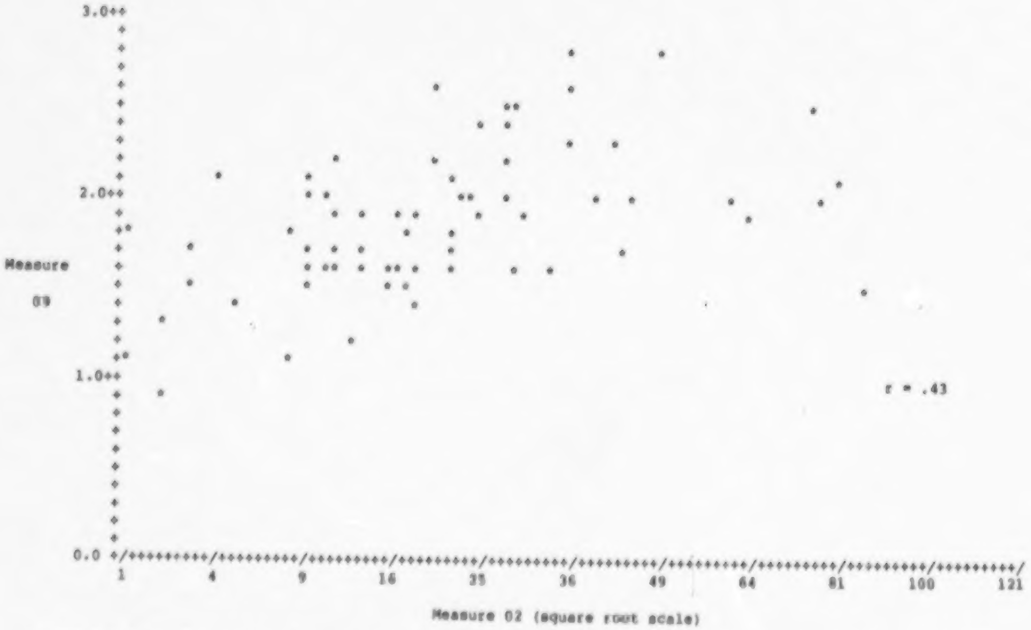
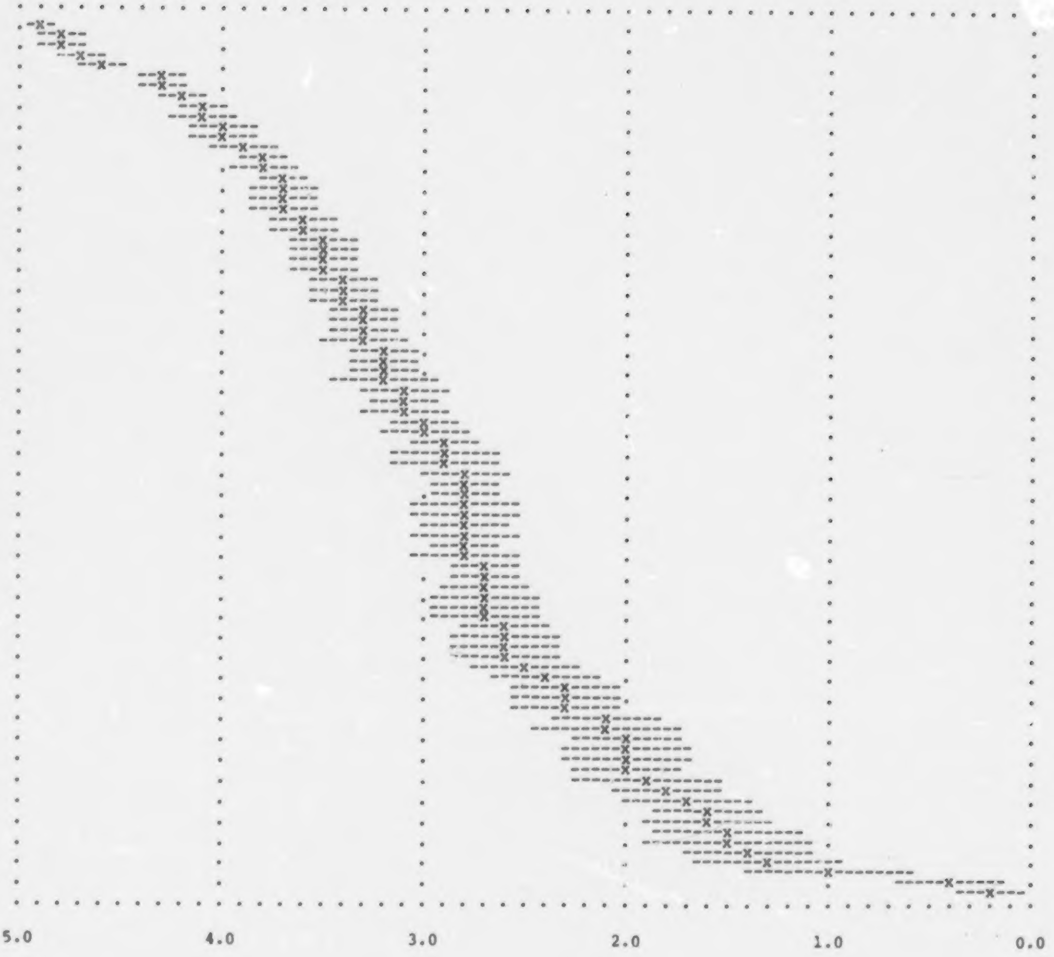


FIGURE 5.2 Mean rating of program effectiveness in educating research scholars/scientists (measure 09) versus number of graduates in last five years (measure 02)--69 programs in cellular/molecular biology.

TABLE 5.4 Characteristics of Survey Participants in Cellular/ Molecular Biology

	Respondents	
	N	%
Field of Specialization		
Biochemistry	17	12
Cell Biology	32	23
Genetics	22	16
Molecular Biology	34	25
Other/Unknown	34	25
Faculty Rank		
Professor	63	45
Associate Professor	46	33
Assistant Professor	30	22
Year of Highest Degree		
Pre-1950	6	4
1950-59	29	21
1960-69	45	32
Post-1969	58	42
Unknown	1	1
Evaluator Selection		
Nominated by Institution	113	81
Other	26	19
Survey Form		
With Faculty Names	130	94
Without Names	9	7
Total Evaluators	139	100



Mean Survey Rating (measure 08)

FIGURE 5.3 Mean rating of scholarly quality of faculty in 86 programs in cellular/molecular biology.

NOTE: Programs are listed in sequence of mean rating, with the highest-rated program appearing at the top of the page. The broken lines (---) indicate a confidence interval of ±1.5 standard errors around the reported mean (x) of each program.

VI
Microbiology Programs

In this chapter 134 research-doctorate programs in microbiology are assessed. These programs, according to the information supplied by their universities, have accounted for 2,058 doctoral degrees awarded during the FY1976-80 period--approximately 87 percent of the aggregate number of microbiology, immunology, parasitology, and bacteriology doctorates earned from U.S. universities in this five-year span.[1] On the average, 20 full-time and part-time students intending to earn doctorates were enrolled in a program in December 1980, with an average faculty size of 16 members.[2] Most of the 134 programs, listed in Table 6.1, are located in departments of microbiology; a few are found in departments of biology, immunology, and other related fields. Eighteen programs were initiated since 1970. Each of eight institutions--Auburn University, University of California (San Francisco), University of Kansas, University of Maryland (Baltimore Professional School), University of Oklahoma, Pennsylvania State University, SUNY at Buffalo, and Tulane University--has two microbiology programs included in the assessment. Each of five other universities--University of California (Berkeley), University of Chicago, Ohio State University, University of Pennsylvania, and University of Pittsburgh--has three programs evaluated. In addition to the 116 institutions represented in this discipline, another 13 were initially identified as meeting the criteria[3] for inclusion in the assessment:

CUNY--Graduate School
University of California--Santa Barbara

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[1] Data from the NRC's Survey of Earned Doctorates indicate that 2,367 research doctorates in microbiology, immunology, parasitology, and bacteriology were awarded by U.S. universities between FY1976 and FY1980.

[2] See the reported means for measures 03 and 01 in Table 6.2.

[3] As mentioned in Chapter I, the primary criterion for inclusion was that a university had awarded at least 4 doctorates in microbiology during the FY1976-78 period.

University of Colorado
Harvard University
Illinois Institute of Technology
University of Utah--Salt Lake City
Washington University--Saint Louis
Medical College of Georgia
University of Mississippi--Medical Center
University of Oregon--Health Sciences Center
Saint John's University
University of Southwestern Louisiana
University of Texas--Health Science Center, Dallas

The last six institutions chose not to participate in the assessment in any discipline. Microbiology programs at the other seven institutions have not been included in the evaluations in this discipline, since in each case the study coordinator either indicated that the institution did not at that time have a research-doctorate program in microbiology or failed to provide the information requested by the committee.

Before examining individual program results presented in Table 6.1, the reader is urged to refer to Chapter II, in which each of the 16 measures used in the assessment is discussed. Summary statistics describing every measure are given in Table 6.2. For nine of the measures, data are reported for at least 116 of the 134 microbiology programs. For measures 04-07, which pertain to characteristics of the program graduates, data are presented for only approximately half of the programs; the other half had too few graduates on which to base statistics.[*] For measure 12, a composite index of the size of a university library, data are available for 85 programs. With respect to measure 13, the fraction of faculty with research grants from the National Institutes of Health, the National Science Foundation, or the Alcohol, Drug Abuse, and Mental Health Administration, data are reported for 102 programs that had at least 10 faculty members. For measure 14, total university expenditures for research in the biological sciences, data are available for 108 programs. The programs not evaluated on measures 12, 13, and 14 are typically smaller--in terms of faculty size and graduate student enrollment--than other microbiology programs. Were data on these three measures available for all 134 programs, it is likely that their reported means would be appreciably lower (and that some of the correlations of these measures with others would be higher).

Intercorrelations among the 16 measures (Pearson product-moment coefficients) are given in Table 6.3. Of particular note are the high positive correlations of reputational survey ratings (08, 09) with measures of publication records (15, 16) and research expenditures

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[*] As mentioned in Chapter II, data for measures 04-07 are not reported if they are based on the survey responses of fewer than 10 FY1975-79 program graduates.

(14). Figure 6.1 illustrates the relation between the mean rating of the scholarly quality of faculty (measure 08) and the number of faculty members (measure 01) for each of 131 programs in microbiology. Figure 6.2 plots the mean rating of program effectiveness (measure 09) against the total number of FY1976-80 program graduates (measure 02). Although in both figures there is a significant positive correlation between program size and reputational rating, it is quite apparent that some of the smaller programs received high mean ratings.

Table 6.4 describes the 231 faculty members who participated in the evaluation of microbiology programs. These individuals constituted 58 percent of those asked to respond to the survey in this discipline and 11 percent of the faculty population in the 134 research-doctorate programs being evaluated.[5] About half of the evaluators identified their specialty field as microbiology/bacteriology; others were split among immunology, molecular biology, and other biological sciences. Two-thirds of the survey participants had earned their highest degree prior to 1970, and exactly half held the rank of full professor.

To assist the reader in interpreting results of the survey evaluations, estimated standard errors have been computed for mean ratings of the scholarly quality of faculty in 131 microbiology programs (and are given in Table 6.1). For each program the mean rating and an associated "confidence interval" of 1.5 standard errors are illustrated in Figure 6.3 (listed in order of highest to lowest mean rating). In comparing two programs, if their confidence intervals do not overlap, one may conclude that there is a significant difference in their mean ratings at a .05 level of significance.[6] From this figure it is also apparent that one should have somewhat more confidence in the accuracy of the mean ratings of higher-rated programs than lower-rated programs. This generalization results primarily from the fact that evaluators are not as likely to be familiar with the less prestigious programs, and consequently the mean ratings of these programs are usually based on fewer survey responses.

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[5] See Table 2.3 in Chapter II.

[6] See pp. 31-33 for a discussion of the interpretation of mean ratings and associated confidence intervals.

TABLE 6.1 Program Measures (Raw and Standardized Values) in Microbiology

Prog No.	University - Department/Academic Unit	Program Size			Characteristics of Program Graduates			
		(01)	(02)	(03)	(04)	(05)	(06)	(07)
001.	Alabama, University of-Birmingham	36	21	35	.53	5.9	.81	.44
	Microbiology	*68*	*55*	*57*	*52*	*53*	*51*	*47*
002.	Albert Einstein College of Medicine	14	3	3	NA	NA	NA	NA
	Microbiology and Immunology	*48*	*39*	*42*				
003.	Arizona, University of-Tucson	12	9	7	NA	NA	NA	NA
	Microbiology and Medical Technology	*46*	*44*	*44*				
004.	Auburn University	7	3	1	NA	NA	NA	NA
	*Botany, Plant Pathology, and Microbiology**	*42*	*39*	*41*				
005.	Auburn University	9	1	3	NA	NA	NA	NA
	*Microbiology (School of Veterinary Med)**	*43*	*37*	*42*				
006.	Baylor College of Medicine-Houston	11	12	15	NA	NA	NA	NA
	Microbiology and Immunology	*45*	*47*	*48*				
007.	Boston University	9	NA	11	.23	7.1	.62	.62
	Biology	*43*		*46*	*41*	*37*	*34*	*57*
008.	Brigham Young University	10	3	9	NA	NA	NA	NA
	Microbiology	*44*	*39*	*45*				
009.	California, University of-Irvine	13	15	20	NA	NA	NA	NA
	*Microbiol/Molec Biol & Biochem/Biol Chem**	*47*	*49*	*50*				
010.	California, University of-Berkeley	5	7	3	1.00	5.9	.82	.64
	Bacteriology	*40*	*43*	*42*	*68*	*53*	*52*	*59*
011.	California, University of-Berkeley	5	12	16	1.00	6.5	.80	.67
	Immunology	*40*	*47*	*48*	*68*	*45*	*50*	*60*
012.	California, University of-Berkeley	5	1	12	NA	NA	NA	NA
	Microbiology	*40*	*37*	*46*				
013.	California, University of-Berkeley	17	6	6	.75	6.2	.69	.31
	*Parasitology**	*51*	*42*	*43*	*59*	*49*	*40*	*40*
014.	California, University of-Davis	78	44	56	.41	6.5	.71	.43
	Microbiology	*99*	*75*	*67*	*48*	*45*	*43*	*47*
015.	California, University of-Los Angeles	34	59	59	.67	6.1	.80	.57
	Microbiology/Immunology	*66*	*88*	*69*	*57*	*50*	*50*	*55*
016.	California, University of-San Diego	18	46	50	.86	5.8	.93	.64
	Biology	*51*	*77*	*65*	*63*	*54*	*61*	*59*
017.	California, University of-San Francisco	4	3	6	NA	NA	NA	NA
	*Immunology**	*39*	*39*	*43*				
018.	California, University of-San Francisco	19	5	9	NA	NA	NA	NA
	Microbiology	*52*	*41*	*45*				
019.	Case Western Reserve University	7	15	15	NA	NA	NA	NA
	Microbiology	*42*	*49*	*48*				
020.	Catholic University of America	6	9	10	.20	NA	.90	.00
	Biology	*41*	*44*	*45*	*40*		*59*	*23*

* indicates program was initiated since 1970.

NOTE: On the first line of data for every program, raw values for each measure are reported; on the second line values are reported in standardized form, with mean = 50 and standard deviation = 10. "NA" indicates that the value for a measure is not available.

TABLE 6.1 Program Measures (Raw and Standardized Values) in Microbiology

Prog	Survey Results				University Library	Research Support		Published Articles		Survey Ratings Standard Error			
No.	(08)	(09)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(08)	(09)	(10)	(11)
001.	3.8	2.3	1.8	1.2	NA	.83	4467	83		.09	.07	.07	.08
	62	*62*	*73*	*68*		*67*	*43*	*59*	*60*				
002.	3.7	2.0	1.2	0.8	NA	.64	9184	47		.13	.10	.11	.08
	60	*55*	*52*	*54*		*58*	*51*	*50*	*58*				
003.	2.2	1.4	1.0	0.4	0.9	.17	7828	7		.18	.12	.19	.07
	42	*40*	*43*	*42*	*56*	*33*	*49*	*40*	*41*				
004.	1.7	1.1	NA	0.2	NA	NA	NA	7		.24	.15	NA	.04
	35	*32*		*36*				*40*	*42*				
005.	1.8	1.3	NA	0.2	NA	NA	NA	7		.25	.15	NA	.05
	36	*37*		*37*				*40*	*42*				
006.	3.1	1.9	1.1	0.7	NA	.36	14051	108		.10	.05	.09	.07
	53	*53*	*46*	*52*		*46*	*59*	*65*	*60*				
007.	1.7	1.3	NA	0.2	-0.4	NA	NA	4		.26	.21	NA	.05
	36	*38*		*37*	*43*			*39*	*41*				
008.	2.0	1.2	NA	0.3	-0.6	.00	NA	8		.20	.16	NA	.06
	40	*36*		*40*	*41*	*31*		*40*	*42*				
009.	3.5	2.0	1.5	0.9	NA	.92	6547	53		.09	.06	.10	.07
	58	*55*	*64*	*57*		*71*	*47*	*52*	*54*				
010.	3.2	2.0	0.8	0.7	2.2	NA	18977	100		.18	.10	.12	.08
	55	*56*	*35*	*50*	*70*		*68*	*63*	*60*				
011.	3.5	2.2	1.0	0.7	2.2	NA	18977	100		.14	.11	.06	.08
	58	*60*	*43*	*53*	*70*		*68*	*63*	*60*				
012.	3.3	1.8	0.8	0.7	2.2	NA	18977	100		.14	.12	.12	.08
	56	*50*	*37*	*51*	*70*		*68*	*63*	*60*				
013.	NA	NA	NA	0.2	2.2	.06	18977	100		NA	NA	NA	.06
				37	*70*	*33*	*68*	*63*	*60*				
014.	4.0	2.4	1.3	1.1	0.6	.40	18053	126		.10	.07	.09	.08
	64	*65*	*54*	*64*	*54*	*48*	*66*	*70*	*57*				
015.	4.1	2.5	1.4	1.4	2.0	.71	15581	226		.08	.06	.07	.07
	66	*67*	*60*	*73*	*68*	*61*	*62*	*95*	*76*				
016.	4.3	2.5	1.5	1.3	-0.0	.78	8706	44		.09	.08	.09	.08
	68	*67*	*61*	*69*	*47*	*64*	*50*	*49*	*55*				
017.	2.6	1.5	0.9	0.4	NA	NA	13194	85		.20	.17	.16	.08
	47	*44*	*38*	*44*			*58*	*60*	*64*				
018.	3.8	2.2	1.4	1.0	NA	.58	13194	85		.12	.09	.10	.08
	62	*60*	*60*	*60*		*56*	*58*	*60*	*64*				
019.	2.6	1.7	0.6	0.6	-1.3	NA	7721	7		.14	.10	.11	.07
	47	*47*	*27*	*50*	*33*		*49*	*40*	*42*				
020.	0.8	NA	NA	0.2	NA	NA	NA	1		.18	NA	NA	.05
	25			*37*				*39*	*41*				

NOTE: On the first line of data for every program, raw values for each measure are reported; on the second line values are reported in standardized form, with mean = 50 and standard deviation = 10. "NA" indicates that the value for a measure is not available. Since the scale used to compute measure 16 is entirely arbitrary, only values in standardized form are reported for this measure.

TABLE 6.1 Program Measures (Raw and Standardized Values) in Microbiology

Prog No.	University - Department/Academic Unit	Program Size (01)	(02)	(03)	Characteristics of Program Graduates (04)	(05)	(06)	(07)
021.	Chicago, University of *Immunology**	15 *49*	11 *46*	19 *50*	NA	NA	NA	NA
022.	Chicago, University of *Microbiology*	8 *42*	20 *54*	30 *55*	NA	NA	NA	NA
023.	Chicago, University of *Virology**	13 *47*	9 *44*	12 *46*	NA	NA	NA	NA
024.	Cincinnati, University of *Microbiology*	13 *47*	16 *50*	12 *46*	.62 *55*	6.3 *48*	.92 *60*	.58 *56*
025.	Colorado State University-Fort Collins *Microbiology*	35 *67*	19 *53*	25 *53*	.08 *36*	6.5 *45*	.67 *38*	.33 *42*
026.	Columbia University *Microbiology*	22 *55*	16 *50*	28 *54*	.39 *47*	6.1 *50*	.77 *47*	.46 *49*
027.	Connecticut, University of-Storrs *Biological Sciences*	11 *45*	6 *42*	6 *43*	NA	NA	NA	NA
028.	Cornell University-Ithaca *Microbiology*	27 *60*	15 *49*	24 *52*	.29 *44*	6.0 *51*	.82 *52*	.41 *46*
029.	Cornell University-Medical Center *Microbiology*	17 *51*	15 *49*	15 *48*	.46 *49*	5.8 *55*	1.00 *67*	.62 *57*
030.	Duke University *Microbiology and Immunology*	39 *70*	35 *67*	55 *67*	.88 *64*	5.9 *53*	.82 *52*	.61 *57*
031.	Emory University *Microbiology*	8 *42*	[illegible] *40*	9 *45*	NA	NA	NA	NA
032.	Florida, University of-Gainesville *Immunol & Med Microbio/ Microbio & Cell Sci*	46 *77*	48 *78*	54 *66*	.36 *46*	5.4 *60*	.69 *40*	.43 *47*
033.	George Washington University *Microbiology*	7 *42*	30 *63*	14 *47*	.14 *38*	10.5 *1*	.57 *30*	.07 *27*
034.	Georgetown University *Microbiology*	8 *42*	16 *50*	15 *48*	.80 *61*	6.5 *45*	.73 *44*	.07 *26*
035.	Georgia, University of-Athens *Microbiology*	10 *44*	34 *66*	14 *47*	.30 *44*	6.7 *43*	.83 *53*	.53 *53*
036.	Hahnemann Medical College *Microbiology and Immunology*	14 *48*	13 *48*	15 *48*	.09 *37*	6.5 *45*	.82 *52*	.36 *43*
037.	Hawaii, University of *Microbiology*	10 *44*	8 *43*	12 *46*	NA	NA	NA	NA
038.	Health Sciences, Univ of/Chicago Med School *Medical Microbiology*	9 *43*	6 *42*	3 *42*	NA	NA	NA	NA
039.	Idaho, University of-Moscow *Bacteriology and Biochemistry*	10 *44*	6 *42*	3 *42*	NA	NA	NA	NA
040.	Illinois, University of-Medical Center *Microbiology and Immunology*	23 *56*	44 *75*	76 *77*	.41 *48*	6.1 *51*	.71 *42*	.50 *51*

* indicates program was initiated since 1970.

NOTE: On the first line of data for every program, raw values for each measure are reported; on the second line values are reported in standardized form, with mean = 50 and standard deviation = 10. "NA" indicates that the value for a measure is not available.

TABLE 6.1 Program Measures (Raw and Standardized Values) in Microbiology

Prog	Survey Results				University Library	Research Support		Published Articles		Survey Ratings Standard Error			
No.	(08)	(09)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(08)	(09)	(10)	(11)
021.	3.4	2.1	1.4	0.6	0.9	.80	17589	88		.13	.08	.11	.08
	57	59	60	48	56	65	65	60	60				
022.	3.7	2.2	1.2	1.0	0.9	NA	17589	88		.11	.08	.09	.08
	61	60	50	61	56		65	60	60				
023.	4.2	2.3	1.5	1.1	0.9	.85	17589	88		.09	.07	.09	.09
	68	64	62	64	56	67	65	60	60				
024.	2.5	1.7	0.9	0.6	-0.2	.39	9365	43		.15	.09	.10	.07
	46	48	40	47	44	47	52	49	46				
025.	2.4	1.7	1.0	0.5	-1.1	.11	8863	17		.13	.08	.10	.07
	44	48	43	44	35	35	51	43	42				
026.	4.0	2.3	1.5	1.1	1.7	.73	11090	63		.08	.07	.09	.07
	64	63	61	62	65	62	54	54	52				
027.	2.9	1.8	1.1	0.7	-0.5	.64	15199	18		.13	.09	.11	.07
	51	50	47	53	42	58	61	43	44				
028.	3.5	2.1	1.3	0.8	1.6	.33	14597	71		.12	.08	.13	.09
	58	58	56	54	64	45	60	56	49				
029.	3.6	2.1	1.2	0.8	NA	.18	14597	45		.12	.08	.09	.09
	60	57	52	56		38	60	50	57				
030.	4.2	2.5	1.4	1.3	0.3	.54	11320	98		.09	.07	.08	.08
	67	67	59	70	50	54	55	63	63				
031.	2.7	1.6	1.8	0.6	-0.6	NA	2874	15		.14	.12	.09	.08
	49	46	73	49	41		41	42	44				
032.	3.3	2.0	1.6	0.7	0.8	.48	3486	62		.11	.07	.10	.09
	56	56	65	51	55	51	42	54	50				
033.	2.3	1.5	0.9	0.4	NA	NA	2641	17		.24	.15	.14	.07
	44	44	39	42			40	43	44				
034.	2.6	1.5	0.8	0.5	-0.6	NA	4200	26		.13	.10	.12	.06
	47	43	36	46	40		43	45	45				
035.	2.8	1.8	1.3	0.8	0.4	.50	10714	68		.13	.08	.12	.08
	50	51	53	55	52	52	54	55	49				
036.	2.2	1.5	1.2	0.5	NA	.43	NA	13		.13	.10	.09	.07
	42	42	51	46		49		42	43				
037.	2.5	1.4	1.1	0.4	-0.1	.20	4440	13		.13	.13	.11	.06
	46	41	45	43	46	39	43	42	43				
038.	1.7	NA	NA	0.2	NA	NA	NA	3		.27	NA	NA	.05
	35			37				39	41				
039.	1.6	1.2	1.1	0.3	NA	.20	1842	14		.24	.15	.17	.06
	34	35	48	38		39	39	42	43				
040.	3.0	2.0	1.1	0.7	NA	.35	4393	95		.11	.08	.13	.06
	52	54	45	52		46	43	62	58				

NOTE: On the first line of data for every program, raw values for each measure are reported; on the second line values are reported in standardized form, with mean = 50 and standard deviation = 10. "NA" indicates that the value for a measure is not available. Since the scale used to compute measure 16 is entirely arbitrary, only values in standardized form are reported for this measure.

TABLE 6.1 Program Measures (Raw and Standardized Values) in Microbiology

Prog No.	University - Department/Academic Unit	Program Size			Characteristics of Program Graduates			
		(01)	(02)	(03)	(04)	(05)	(06)	(07)
041.	Illinois, University-Urbana/Champaign	20	26	58	.71	6.5	.83	.53
	Microbiology	*53*	*59*	*68*	*58*	*45*	*53*	*53*
042.	Indiana State University-Terre Haute	13	8	7	NA	NA	NA	NA
	Life Sciences	*47*	*43*	*44*				
043.	Indiana University-Bloomington	11	12	18	.67	5.9	.87	.53
	Biology	*45*	*47*	*49*	*56*	*52*	*56*	*53*
044.	Indiana University-Purdue University	14	16	10	.46	6.3	.92	.39
	Microbiology and Immunology	*48*	*50*	*45*	*49*	*47*	*61*	*44*
045.	Iowa State University-Ames	7	14	26	.00	6.3	.75	.50
	Microbiology	*42*	*49*	*53*	*33*	*48*	*46*	*51*
046.	Iowa, University of-Iowa City	21	20	15	.11	5.4	.95	.67
	Microbiology	*54*	*54*	*48*	*37*	*59*	*63*	*60*
047.	Johns Hopkins University	11	14	9	.89	6.5	.81	.75
	Microbiology	*45*	*49*	*45*	*64*	*45*	*51*	*65*
048.	Kansas State University-Manhattan	13	11	15	NA	NA	NA	NA
	Biology	*47*	*46*	*48*				
049.	Kansas, University of	12	24	17	.67	4.9	.88	.75
	Microbiology (Graduate School)	*46*	*57*	*49*	*56*	*66*	*56*	*65*
050.	Kansas, University of	12	11	14	.73	NA	.91	.55
	Microbiology (Schl of Medicine-Kansas City)	*46*	*46*	*47*	*58*		*59*	*54*
051.	Kentucky, University of	18	8	8	NA	NA	NA	NA
	Biological Sciences	*51*	*43*	*44*				
052.	Louisiana State University-Baton Rouge	10	10	5	.09	5.8	.46	.27
	Microbiology	*44*	*45*	*43*	*37*	*55*	*20*	*38*
053.	Louisiana State Univ-School of Medicine	26	7	11	NA	NA	NA	NA
	Microbiology and Immunology	*59*	*43*	*46*				
054.	Louisville, University of	15	12	28	NA	NA	NA	NA
	Microbiology and Immunology	*49*	*47*	*54*				
055.	Loyola University of Chicago	12	11	17	NA	NA	NA	NA
	Microbiology	*46*	*46*	*49*				
056.	Maryland, University of-Baltimore Prof Schl	7	12	11	NA	NA	NA	NA
	Dental Microbiology	*42*	*47*	*46*				
057.	Maryland, University of-Baltimore Prof Schl	14	8	4	NA	NA	NA	NA
	Microbiology (School of Medicine)	*48*	*43*	*42*				
058.	Maryland, University of-College Park	13	NA	24	.11	7.0	.67	.11
	Microbiology	*47*		*52*	*37*	*39*	*38*	*29*
059.	Massachusetts Institute of Technology	16	28	27	.88	5.8	.87	.57
	Biology	*50*	*61*	*54*	*64*	*54*	*56*	*55*
060.	Massachusetts, University of-Amherst	12	20	29	.42	5.7	.92	.83
	Microbiology	*46*	*54*	*54*	*48*	*56*	*60*	*70*

* indicates program was initiated since 1970.

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TABLE 6.1 Program Measures (Raw and Standardized Values) in Microbiology

Prog No.	Survey Results (08)	(09)	(10)	(11)	University Library (12)	Research Support (13)	(14)	Published Articles (15)	(16)	Survey Ratings Standard Error (08)	(09)	(10)	(11)
041.	4.0	2.5	1.2	1.2	2.0	.65	6074	38		.10	.06	.08	.08
	65	*67*	*52*	*65*	*68*	*59*	*46*	*48*	*47*				
042.	1.6	NA	NA	0.2	NA	.39	NA	0		.23	NA	NA	.06
	34			*37*		*47*		*38*	*41*				
043.	3.2	2.0	1.1	0.9	0.9	.55	NA	15		.11	.08	.11	.08
	54	*55*	*45*	*58*	*57*	*54*		*42*	*44*				
044.	2.5	1.7	1.1	0.5	NA	.43	2940	NA		.12	.08	.11	.07
	46	*48*	*46*	*45*		*49*	*41*		*NA*				
045.	2.6	1.8	0.7	0.6	-0.5	NA	5287	39		.13	.10	.10	.07
	47	*50*	*33*	*48*	*42*		*45*	*48*	*47*				
046.	3.0	2.1	1.3	0.8	0.3	.71	7088	59		.08	.06	.12	.07
	52	*57*	*55*	*54*	*50*	*62*	*48*	*53*	*48*				
047.	4.3	2.5	1.2	1.3	-0.4	.46	19837	122		.09	.07	.09	.07
	68	*67*	*52*	*70*	*43*	*50*	*69*	*69*	*68*				
048.	2.6	1.7	1.2	0.5	NA	.39	2496	25		.13	.09	.10	.07
	47	*47*	*51*	*47*		*47*	*40*	*45*	*44*				
049.	2.5	1.8	1.0	0.6	0.1	.25	3161	5		.13	.09	.10	.08
	46	*49*	*45*	*48*	*48*	*41*	*41*	*40*	*41*				
050.	2.1	1.4	1.0	0.3	0.1	.25	3161	42		.15	.14	.14	.06
	41	*41*	*43*	*39*	*48*	*41*	*41*	*49*	*47*				
051.	2.1	1.4	0.8	0.6	-0.1	.56	184	35		.12	.10	.11	.07
	41	*40*	*36*	*48*	*46*	*55*	*37*	*47*	*46*				
052.	2.3	1.4	1.2	0.5	-0.3	.10	5116	8		.18	.12	.11	.08
	43	*41*	*49*	*44*	*43*	*35*	*44*	*40*	*41*				
053.	2.5	1.4	1.3	0.4	NA	.23	5116	37		.15	.11	.12	.06
	45	*41*	*55*	*44*		*41*	*44*	*48*	*45*				
054.	2.6	1.6	1.1	0.4	NA	.40	NA	15		.14	.12	.10	.06
	47	*44*	*45*	*43*		*48*		*42*	*43*				
055.	2.4	1.7	1.5	0.4	NA	.00	NA	10		.13	.10	.11	.06
	45	*47*	*61*	*43*		*31*		*41*	*42*				
056.	1.7	1.2	0.9	0.3	NA	NA	6061	62		.17	.11	.08	.05
	35	*35*	*38*	*38*			*46*	*54*	*49*				
057.	2.1	1.4	0.8	0.4	NA	.21	6061	62		.16	.14	.11	.07
	41	*40*	*36*	*44*		*40*	*46*	*54*	*49*				
058.	3.0	1.9	1.0	0.7	0.2	.31	1623	10		.14	.09	.11	.09
	52	*53*	*44*	*52*	*49*	*44*	*39*	*41*	*42*				
059.	4.9	2.9	1.4	1.7	-0.3	.94	17348	85		.03	.04	.06	.06
	77	*77*	*59*	*83*	*43*	*71*	*65*	*60*	*65*				
060.	3.2	1.9	1.1	0.7	-0.7	.83	3022	41		.11	.07	.10	.08
	55	*53*	*48*	*52*	*39*	*67*	*41*	*49*	*48*				

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TABLE 6.1 Program Measures (Raw and Standardized Values) in Microbiology

Prog No.	University - Department/Academic Unit	Program Size			Characteristics of Program Graduates			
		(01)	(02)	(03)	(04)	(05)	(06)	(07)
061.	Medical College of Wisconsin	11	9	8	NA	NA	NA	NA
	Microbiology	*45*	*44*	*44*				
062.	Medical University of South Carolina	19	8	15	NA	NA	NA	NA
	*Basic & Clinical Immunology & Microbiology**	*52*	*43*	*48*				
063.	Miami University-Ohio	7	13	6	NA	NA	NA	NA
	*Microbiology**	*42*	*48*	*43*				
064.	Miami, University of-Florida	17	24	14	.21	5.2	.83	.72
	Microbiology	*51*	*57*	*47*	*41*	*61*	*53*	*64*
065.	Michigan State University-East Lansing	33	30	29	.59	6.2	.83	.48
	Microbiology and Public Health	*65*	*63*	*54*	*54*	*49*	*52*	*50*
066.	Michigan, University of-Ann Arbor	26	24	19	.60	5.9	.93	.67
	Microbiology	*59*	*57*	*50*	*54*	*53*	*61*	*60*
067.	Minnesota, University of	18	23	39	.65	6.3	.69	.50
	Microbiology	*51*	*56*	*59*	*56*	*48*	*40*	*51*
068.	Mississippi State University-Starkville	11	7	7	NA	NA	NA	NA
	Biological Sciences	*45*	*43*	*44*				
069.	Mississippi, University of-Oxford	4	6	4	NA	NA	NA	NA
	Biology	*39*	*42*	*42*				
070.	Missouri, University of-Columbia	23	23	10	.16	5.0	.84	.53
	Microbiology	*56*	*56*	*45*	*39*	*64*	*54*	*52*
071.	Montana State University-Bozeman	10	7	8	NA	NA	NA	NA
	Microbiology	*44*	*43*	*44*				
072.	Nebraska, University of-Lincoln	10	15	19	.07	6.1	.57	.53
	Life Sciences	*44*	*49*	*50*	*36*	*50*	*38*	*53*
073.	New Hampshire, University of	7	12	8	.18	6.0	.91	.55
	Microbiology	*42*	*47*	*44*	*40*	*51*	*59*	*54*
074.	New Jersey, College of Medicine & Dentistry	20	8	15	NA	NA	NA	NA
	*Microbiology**	*53*	*43*	*48*				
075.	New York University	31	22	27	.77	7.5	1.00	.54
	Basic Medical Sciences	*63*	*56*	*54*	*60*	*32*	*67*	*53*
076.	North Carolina State University-Raleigh	16	20	25	.21	5.4	.74	.47
	Microbiology	*50*	*54*	*53*	*41*	*59*	*45*	*49*
077.	North Carolina, University of-Chapel Hill	24	24	36	.93	5.0	.93	.79
	Bacteriology and Immunology	*57*	*57*	*58*	*65*	*64*	*61*	*67*
078.	Northwestern University	17	12	12	.94	5.3	.94	.78
	Microbiology/Immunology	*51*	*47*	*46*	*66*	*61*	*62*	*67*
079.	Notre Dame, University of	11	19	18	.43	6.2	.89	.50
	Microbiology/Biology	*45*	*53*	*49*	*48*	*49*	*58*	*51*
080.	Ohio State University-Columbus	18	11	15	.25	5.5	.67	.33
	*Medical Microbiology and Immunology**	*51*	*46*	*48*	*42*	*58*	*38*	*42*

* indicates program was initiated since 1970.

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TABLE 6.1 Program Measures (Raw and Standardized Values) in Microbiology

Prog No.	Survey Results				University Library	Research Support		Published Articles		Survey Ratings Standard Error			
	(08)	(09)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(08)	(09)	(10)	(11)
061.	2.3	1.6	1.1	0.4	NA	.36	2085	20		.13	.10	.08	.06
	44	*46*	*45*	*44*		*46*	*39*	*43*	*43*				
062.	2.6	1.7	1.6	0.7	NA	.37	3178	55		.15	.10	.10	.07
	47	*48*	*67*	*51*		*47*	*41*	*52*	*50*				
063.	1.8	1.4	1.1	0.4	-0.8	NA	NA	5		.17	.16	.11	.06
	37	*42*	*47*	*41*	*39*			*40*	*42*				
064.	2.4	1.6	1.1	0.4	NA	.29	6101	17		.13	.09	.11	.06
	44	*45*	*45*	*44*		*43*	*46*	*43*	*44*				
065.	3.4	2.2	1.3	1.0	0.3	.70	10357	77		.09	.07	.09	.08
	57	*60*	*56*	*62*	*50*	*61*	*53*	*58*	*52*				
066.	3.8	2.4	1.6	1.2	1.8	.65	15431	54		.08	.06	.08	.07
	62	*65*	*64*	*67*	*66*	*59*	*62*	*52*	*51*				
067.	3.6	2.3	1.2	1.1	1.2	.61	13696	151		.08	.06	.09	.09
	60	*62*	*51*	*63*	*59*	*57*	*59*	*76*	*63*				
068.	1.5	0.9	1.0	0.2	NA	.00	2839	7		.20	.16	.10	.05
	33	*28*	*43*	*37*		*31*	*41*	*40*	*42*				
069.	0.8	0.7	NA	0.2	NA	NA	NA	4		.19	.15	NA	.05
	24	*22*		*36*				*39*	*41*				
070.	2.8	1.8	1.7	0.8	-0.2	.22	4628	NA		.11	.07	.09	.07
	49	*50*	*69*	*55*	*45*	*40*	*44*		*NA*				
071.	2.3	1.4	1.6	0.3	NA	.20	766	19		.21	.15	.15	.06
	44	*41*	*66*	*40*		*39*	*37*	*43*	*42*				
072.	2.1	1.6	1.1	0.4	-0.5	.50	2965	37		.18	.13	.14	.06
	41	*45*	*45*	*42*	*42*	*52*	*41*	*48*	*45*				
073.	2.1	1.4	1.2	0.5	NA	NA	NA	9		.17	.12	.15	.07
	41	*41*	*50*	*44*				*41*	*42*				
074.	2.5	1.4	1.4	0.4	NA	.30	4529	37		.14	.12	.13	.07
	46	*41*	*59*	*43*		*44*	*43*	*48*	*48*				
075.	4.0	2.2	1.2	1.0	0.5	.32	9934	98		.09	.07	.11	.08
	65	*60*	*50*	*61*	*52*	*45*	*52*	*63*	*68*				
076.	2.7	1.9	1.3	0.6	NA	.13	6741	38		.12	.07	.11	.09
	49	*52*	*53*	*48*		*36*	*47*	*48*	*46*				
077.	3.7	2.1	1.3	1.1	1.0	.75	9849	72		.09	.05	.09	.08
	60	*57*	*56*	*65*	*57*	*63*	*52*	*56*	*51*				
078.	2.8	1.8	1.1	0.5	0.3	.53	4760	48		.13	.10	.11	.07
	49	*51*	*47*	*46*	*50*	*54*	*44*	*50*	*48*				
079.	2.7	1.7	1.0	0.5	-1.3	.55	NA	8		.14	.10	.08	.07
	49	*47*	*42*	*46*	*33*	*54*		*40*	*42*				
080.	2.6	1.6	1.1	0.6	0.9	.17	8330	31		.11	.09	.10	.07
	47	*45*	*45*	*49*	*56*	*38*	*50*	*46*	*46*				

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TABLE 6.1 Program Measures (Raw and Standardized Values) in Microbiology

Prog No.	University - Department/Academic Unit	Program Size			Characteristics of Program Graduates			
		(01)	(02)	(03)	(04)	(05)	(06)	(07)
081.	Ohio State University-Columbus	13	41	47	.23	5.6	.79	.41
	Microbiology	*47*	*72*	*63*	*41*	*57*	*49*	*46*
082.	Ohio State University-Columbus	16	10	12	.60	NA	.90	.70
	Veterinary Pathobiology	*50*	*45*	*46*	*54*		*59*	*62*
083.	Oklahoma State University-Stillwater	5	4	8	NA	NA	NA	NA
	Microbiology	*40*	*40*	*44*				
084.	Oklahoma, University of-Norman	11	10	11	.30	7.0	.70	.20
	Botany/Microbiology (Graduate School)	*45*	*45*	*46*	*44*	*39*	*41*	*34*
085.	Oklahoma, University of-Norman	16	16	30	.20	5.5	.80	.60
	Microbiology and Immunology (Health Sci)	*50*	*50*	*55*	*40*	*58*	*50*	*57*
086.	Oregon State University-Corvallis	11	22	26	.24	6.1	.73	.27
	Microbiology	*45*	*56*	*53*	*42*	*50*	*44*	*38*
087.	Oregon, University of-Eugene	5	2	6	NA	NA	NA	NA
	Biology	*40*	*38*	*43*				
088.	Pennsylvania State University	12	21	21	.44	5.5	.92	.72
	Microbiology (Graduate School)	*46*	*55*	*51*	*49*	*58*	*60*	*63*
089.	Pennsylvania State University	13	5	14	NA	NA	NA	NA
	*Microbiology Medical Center)**	*47*	*41*	*47*				
090.	Pennsylvania, University of	45	22	27	.81	6.2	.81	.48
	*Immunology**	*76*	*56*	*54*	*61*	*49*	*51*	*50*
091.	Pennsylvania, University of	44	20	28	.85	6.2	.77	.39
	Microbiology	*75*	*54*	*54*	*63*	*49*	*47*	*44*
092.	Pennsylvania, University of	14	6	7	NA	NA	NA	NA
	Parasitology	*48*	*42*	*44*				
093.	Pittsburgh, University of	29	6	14	.15	6.6	.50	.30
	*Biological Sciences (Arts and Sciences)**	*61*	*42*	*47*	*39*	*43*	*24*	*40*
094.	Pittsburgh, University of	6	8	5	NA	NA	NA	NA
	Microbiology (Grad School of Public Health)	*41*	*43*	*43*				
095.	Pittsburgh, University of	12	10	13	NA	NA	NA	NA
	Microbiology (School of Medicine)	*46*	*45*	*47*				
096.	Puerto Rico, University of	9	3	1	NA	NA	NA	NA
	Microbiology and Medical Zoology	*43*	*39*	*41*				
097.	Purdue University-West Lafayette	13	23	43	.25	6.0	.75	.50
	Biological Sciences	*47*	*56*	*61*	*42*	*51*	*46*	*51*
098.	Rensselaer Polytechnic Institute	7	10	6	NA	NA	NA	NA
	Biology	*42*	*45*	*43*				
099.	Rhode Island, University of	9	15	11	.19	6.0	.56	.25
	Microbiology	*43*	*49*	*46*	*40*	*51*	*29*	*37*
100.	Rochester, University of	22	28	34	.84	6.4	.89	.72
	Microbiology	*55*	*61*	*57*	*62*	*47*	*58*	*64*

* indicates program was initiated since 1970.

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TABLE 6.1 Program Measures (Raw and Standardized Values) in Microbiology

Prog	Survey Results				University Library	Research Support		Published Articles		Survey Ratings Standard Error			
No.	(08)	(09)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(08)	(09)	(10)	(11)
081.	2.5	1.7	0.8	0.6	0.9	.15	8330	49		.14	.09	.10	.07
	45	*47*	*37*	*49*	*56*	*37*	*50*	*51*	*46*				
082.	2.4	NA	NA	0.1	0.9	.31	8330	31		.25	NA	NA	.04
	4[illegible]			*35*	*56*	*44*	*50*	*46*	*46*				
083.	1.8	1.0	0.7	0.5	-1.9	NA	3127	11		.20	.13	.12	.08
	37	*30*	*30*	*45*	*26*		*41*	*41*	*42*				
084.	1.9	1.4	0.9	0.4	-0.6	.27	NA	7		.17	.12	.14	.07
	38	*40*	*41*	*42*	*41*	*42*		*40*	*41*				
085.	2.2	1.7	1.2	0.3	-0.6	.25	NA	11		.14	.11	.10	.06
	42	*47*	*51*	*39*	*41*	*41*		*41*	*42*				
086.	2.8	1.9	1.1	0.6	NA	.64	7108	39		.13	.06	.10	.08
	50	*52*	*49*	*48*		*58*	*48*	*48*	*45*				
087.	3.4	1.9	1.2	0.5	-0.9	NA	NA	3		.20	.14	.10	.08
	57	*54*	*51*	*47*	*37*			*39*	*42*				
088.	2.3	1.5	0.4	0.6	0.7	.50	8024	40		.15	.12	.13	.07
	43	*43*	*20*	*48*	*54*	*52*	*49*	*48*	*46*				
089.	3.1	1.9	1.1	1.0	0.7	.85	8024	35		.10	.07	.09	.07
	53	*53*	*49*	*61*	*54*	*67*	*49*	*47*	*48*				
090.	4.2	2.4	1.5	1.0	0.7	.51	23550	130		.09	.08	.12	.09
	67	*64*	*63*	*61*	*54*	*53*	*75*	*71*	*81*				
091.	4.0	2.3	1.3	1.2	0.7	.48	23550	130		.08	.06	.09	.07
	64	*62*	*56*	*66*	*54*	*51*	*75*	*71*	*81*				
092.	NA	NA	NA	0.2	0.7	.57	23550	130		NA	NA	NA	.05
				35	*54*	*55*	*75*	*71*	*81*				
093.	3.1	1.9	1.3	0.6	0.1	.69	6462	25		.13	.07	.13	.07
	54	*53*	*54*	*49*	*48*	*61*	*47*	*45*	*45*				
094.	2.3	1.5	0.6	0.4	0.1	NA	6462	43		.19	.12	.11	.07
	43	*43*	*28*	*43*	*48*		*47*	*49*	*48*				
095.	2.8	1.7	1.0	0.6	0.1	.67	6462	43		.12	.09	.09	.07
	49	*4[illegible]*	*44*	*49*	*48*	*60*	*47*	*49*	*48*				
096.	NA	NA	NA	0.1	NA	NA	NA	1		NA	NA	NA	.03
				34				*39*	*41*				
097.	3.6	2.2	1.2	1.1	-0.5	.54	10337	31		.09	.07	.08	.08
	60	*59*	*52*	*63*	*41*	*54*	*53*	*46*	*48*				
098.	2.4	NA	NA	0.2	NA	NA	NA	6		.18	NA	NA	.05
	44			*37*				*40*	*42*				
099.	2.2	1.3	NA	0.3	NA	NA	NA	7		.15	.13	NA	.06
	42	*37*		*40*				*40*	*42*				
100.	3.2	2.1	1.3	0.7	-0.6	.55	15969	57		.11	.08	.12	.08
	55	*57*	*54*	*51*	*40*	*54*	*63*	*53*	*56*				

NOTE: On the first line of data for every program, raw values for each measure are reported; on the second line values are reported in standardized form, with mean = 50 and standard deviation = 10. "NA" indicates that the value for a measure is not available. Since the scale used to compute measure 16 is entirely arbitrary, only values in standardized form are reported for this measure.

TABLE 6.1 Program Measures (Raw and Standardized Values) in Microbiology

Prog No.	University - Department/Academic Unit	Program Size (01)	(02)	(03)	Characteristics of Program Graduates (04)	(05)	(06)	(07)
101.	Rockefeller University	33	20	23	.42	6.1	.84	.76
	Microbiology	*65*	*54*	*52*	*48*	*50*	*53*	*66*
102.	Rutgers, The State University-New Brunswick	65	66	198	.56	5.8	.83	.44
	Microbiology	*94*	*94*	*99*	*53*	*54*	*53*	*47*
103.	SUNY Upstate Medical Center	8	9	10	NA	NA	NA	NA
	Microbiology	*42*	*44*	*45*				
104.	SUNY at Buffalo	18	12	5	NA	NA	NA	NA
	Microbiology (Roswell Park Graduate Div)	*51*	*47*	*43*				
105.	SUNY at Buffalo	28	28	49	.57	6.0	.78	.30
	Microbiology (School of Medicine)	*61*	*61*	*64*	*53*	*51*	*48*	*40*
106.	SUNY-Downstate Medical Center	13	7	10	NA	NA	NA	NA
	Microbiology and Immunology	*47*	*43*	*45*				
107.	Saint Louis University	9	5	7	NA	NA	NA	NA
	Microbiology	*43*	*41*	*44*				
108.	Southern California, University of	16	3	7	NA	NA	NA	NA
	Microbiology	*50*	*39*	*44*				
109.	Southern Illinois University-Carbondale	16	5	9	NA	NA	NA	NA
	Microbiology	*50*	*41*	*45*				
110.	Stanford University	9	22	10	.71	5.9	.83	.54
	Medical Microbiology	*43*	*56*	*45*	*58*	*53*	*53*	*53*
111.	Syracuse University	9	9	11	NA	NA	NA	NA
	*Biology**	*43*	*44*	*46*				
112.	Temple University	17	23	28	.82	5.9	.82	.25
	Microbiology and Immunology	*51*	*56*	*54*	*62*	*53*	*52*	*37*
113.	Tennessee, Univ of-Ctr for Healtn Sciences	16	4	5	NA	NA	NA	NA
	Microbiology and Immunology	*50*	*40*	*43*				
114.	Tennessee, University of-Knoxville	15	12	21	NA	NA	NA	NA
	Microbiology	*49*	*47*	*51*				
115.	Texas A & M University	6	7	12	NA	NA	.60	.20
	Biology	*41*	*43*	*46*			*33*	*34*
116.	Texas, U of-Health Science Center, Houston	26	14	24	.30	NA	.80	.40
	Virology/ Devl Therapeut/ Organ Transplant	*59*	*49*	*52*	*44*		*50*	*45*
117.	Texas, University of-Austin	19	32	58	.83	6.8	.86	.55
	Microbiology	*52*	*64*	*68*	*62*	*42*	*55*	*54*
118.	Texas, U of-Health Science Ctr, San Antonio	25	13	12	.09	7.5	.91	.46
	*Microbiology**	*58*	*48*	*46*	*37*	*32*	*59*	*48*
119.	Texas, University of-Med Branch, Galveston	17	7	18	NA	NA	NA	NA
	*Microbiology**	*51*	*43*	*49*				
120.	Thomas Jefferson University	12	9	13	.00	5.8	.70	.40
	Microbiology	*46*	*44*	*47*	*33*	*54*	*41*	*45*

* indicates program was initiated since 1970.

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TABLE 6.1 Program Measures (Raw and Standardized Values) in Microbiology

Prog No.	Survey Results				University Library	Research Support		Published Articles		Survey Ratings Standard Error			
	(08)	(09)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(08)	(09)	(10)	(11)
101.	4.8	2.7	1.2	1.5	NA	.79	27299	120		.05	.05	.06	.06
	75	*72*	*51*	*76*		*65*	*81*	*69*	*94*				
102.	3.8	2.3	1.2	1.3	0.8	.26	7505	37		.09	.07	.09	.08
	62	*63*	*52*	*70*	*55*	*42*	*48*	*48*	*45*				
103.	2.0	1.6	NA	0.3	NA	NA	NA	17		.24	.14	NA	.06
	40	*44*		*39*				*43*	*43*				
104.	2.6	1.7	1.2	0.5	0.3	.00	6799	6		.16	.09	.12	.06
	47	*47*	*52*	*46*	*50*	*31*	*47*	*40*	*42*				
105.	3.1	1.9	1.2	0.7	0.3	.29	6799	82		.13	.08	.11	.07
	53	*53*	*50*	*52*	*50*	*43*	*47*	*59*	*55*				
106.	2.5	1.5	1.1	0.3	NA	.46	3077	39		.18	.10	.10	.05
	46	*43*	*47*	*40*		*51*	*41*	*48*	*50*				
107.	2.6	1.6	0.8	0.5	NA	NA	3674	25		.14	.10	.08	.07
	47	*46*	*35*	*46*			*42*	*45*	*46*				
108.	3.2	1.7	1.3	0.7	0.4	.56	2405	49		.14	.10	.10	.07
	55	*48*	*55*	*52*	*51*	*55*	*40*	*51*	*50*				
109.	1.8	1.2	1.2	0.5	-0.2	.19	NA	11		.14	.13	.14	.07
	37	*36*	*49*	*46*	*45*	*39*		*41*	*43*				
110.	4.0	2.2	1.4	1.0	2.0	NA	12514	112		.08	.08	.10	.07
	64	*61*	*58*	*62*	*68*		*57*	*66*	*75*				
111.	2.5	1.7	0.8	0.7	-0.3	NA	NA	6		.13	.09	.11	.08
	46	*48*	*36*	*52*	*43*			*40*	*42*				
112.	2.7	1.7	0.9	0.8	-0.4	.53	6914	27		.12	.10	.12	.08
	49	*47*	*38*	*54*	*42*	*54*	*47*	*45*	*46*				
113.	2.9	1.6	1.3	0.7	NA	.13	2127	30		.11	.09	.08	.08
	51	*44*	*55*	*52*		*36*	*39*	*46*	*46*				
114.	2.6	1.9	1.3	0.7	-0.4	.60	NA	8		.12	.07	.10	.08
	47	*52*	*55*	*52*	*43*	*57*		*40*	*42*				
115.	1.5	0.9	NA	0.3	-0.5	NA	3199	23		.23	.22	NA	.07
	33	*27*		*40*	*42*		*41*	*44*	*45*				
116.	3.1	1.8	1.3	0.8	NA	.50	4151	NA		.11	.08	.11	.07
	53	*51*	*56*	*54*		*52*	*43*		*NA*				
117.	3.3	2.1	1.2	0.9	1.6	.74	5757	53		.09	.08	.10	.08
	56	*57*	*52*	*57*	*64*	*63*	*46*	*52*	*50*				
118.	2.6	1.6	1.5	0.6	NA	.32	6064	NA		.12	.09	.12	.07
	47	*45*	*62*	*49*		*44*	*46*		*NA*				
119.	2.7	1.7	1.7	0.4	NA	.47	4581	NA		.18	.13	.10	.07
	48	*47*	*70*	*44*		*51*	*44*		*NA*				
120.	2.0	1.4	0.9	0.4	NA	.17	1851	25		.17	.11	.11	.06
	40	*39*	*39*	*42*		*38*	*39*	*45*	*49*				

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TABLE 6.1 Program Measures (Raw and Standardized Values) in Microbiology

Prog No.	University - Department/Academic Unit	Program Size (01)	Program Size (02)	Program Size (03)	Characteristics of Program Graduates (04)	Characteristics of Program Graduates (05)	Characteristics of Program Graduates (06)	Characteristics of Program Graduates (07)
121.	Tufts University	19	8	16	NA	NA	NA	NA
	*Immunology**	*52*	*43*	*48*				
122.	Tulane University	6	4	8	NA	NA	NA	NA
	Microbiology and Immunology	*41*	*40*	*44*				
123.	Tulane University	7	7	10	NA	NA	NA	NA
	Parasitology	*42*	*43*	*45*				
124.	Vanderbilt University	11	9	13	NA	NA	NA	NA
	Microbiology	*45*	*44*	*47*				
125.	Virginia Commonwealth University/Medical Col	25	25	32	.65	6.8	.80	.50
	Microbiology	*58*	*58*	*56*	*56*	*42*	*50*	*51*
126.	Virginia Polytechnic Institute & State Univ	17	15	16	.14	5.5	1.00	.57
	Biology & Anaerobic Microbiology	*51*	*49*	*48*	*38*	*58*	*67*	*55*
127.	Virginia, University of	13	21	24	.95	5.3	1.00	.61
	Microbiology	*47*	*55*	*52*	*66*	*61*	*67*	*57*
128.	Wake Forest University	14	8	21	NA	NA	NA	NA
	Microbiology and Immunology	*48*	*43*	*51*				
129.	Washington State University-Pullman	10	13	15	NA	NA	NA	NA
	Bacteriology and Public Health	*44*	*48*	*48*				
130.	Washington, University of-Seattle	25	28	20	.81	5.6	.87	.55
	Microbiology and Immunology	*58*	*61*	*50*	*61*	*57*	*56*	*54*
131.	Wayne State University	32	16	14	.27	5.3	.73	.27
	Immunology and Microbiology	*64*	*50*	*47*	*43*	*60*	*44*	*38*
132.	West Virginia University	17	22	8	.21	6.4	.85	.45
	Microbiology	*51*	*56*	*44*	*41*	*47*	*54*	*48*
133.	Wisconsin, University of-Madison	11	37	36	.58	5.3	.75	.39
	Bacteriology	*45*	*69*	*58*	*53*	*60*	*46*	*45*
134.	Yale University	25	22	35	.86	7.7	.62	.43
	Epidemiology and Public Health/ Biology	*58*	*56*	*57*	*63*	*30*	*34*	*47*

* indicates program was initiated since 1970.

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TABLE 6.1 Program Measures (Raw and Standardized Values) in Microbiology

Prog No.	Survey Results				University Library	Research Support		Published Articles		Survey Ratings Standard Error			
	(08)	(09)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(08)	(09)	(10)	(11)
121.	3.3	1.9	1.5	0.7	NA	.63	3518	48		.16	.08	.10	.08
	56	54	62	50		58	42	50	52				
122.	1.9	1.2	0.8	0.4	-1.0	NA	3690	25		.22	.15	.15	.06
	38	35	36	44	36		42	45	43				
123.	2.2	NA	NA	0.1	-1.0	NA	3690	25		.35	NA	NA	.04
	43			35	36		42	45	43				
124.	3.4	2.0	1.1	0.9	-0.7	.82	5204	26		.11	.06	.08	.08
	58	55	47	56	39	66	45	45	46				
125.	2.9	1.9	1.5	0.6	NA	.48	6556	52		.11	.06	.10	.08
	50	52	63	48		51	47	51	48				
126.	3.1	2.1	1.5	0.6	-0.0	.41	3108	46		.12	.10	.11	.08
	54	57	64	50	47	48	41	50	47				
127.	3.3	2.0	1.2	0.8	0.7	.77	6224	48		.11	.06	.11	.08
	56	56	52	55	55	64	46	50	49				
128.	2.5	1.6	1.2	0.6	NA	.50	3010	32		.13	.10	.10	.07
	45	46	52	47		52	41	46	45				
129.	2.4	1.6	NA	0.3	-0.3	.30	998	34		.20	.17	NA	.07
	44	46		40	44	44	38	47	46				
130.	4.3	2.4	1.5	1.3	1.5	.52	14164	112		.06	.07	.08	.08
	69	66	61	70	62	53	60	66	65				
131.	3.0	1.9	1.5	0.7	-0.4	.34	6372	37		.12	.07	.11	.07
	52	53	61	51	43	45	47	48	48				
132.	2.4	1.4	1.2	0.5	NA	.24	NA	15		.15	.12	.14	.07
	44	40	50	44		41		42	42				
133.	3.8	2.5	1.3	1.2	1.6	.73	19738	124		.11	.07	.09	.08
	62	66	53	65	63	62	69	70	62				
134.	3.9	2.2	0.9	1.0	2.1	.56	4337	100		.10	.06	.10	.08
	63	61	40	61	69	55	43	63	67				

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TABLE 6.2 Summary Statistics Describing Each Program Measure--Microbiology

Measure	Number of Programs Evaluated	Mean	Standard Deviation	DECILES 1	2	3	4	5	6	7	8	9
Program Size												
01 Raw Value	134	16	11	7	9	10	12	13	16	17	22	29
Std Value	134	50	10	42	43	44	46	47	50	51	55	61
02 Raw Value	132	16	11	4	7	8	10	12	15	20	23	28
Std Value	132	50	10	40	43	43	45	47	49	54	56	61
03 Raw Value	134	20	21	5	8	10	12	14	16	21	27	36
Std Value	134	50	10	43	44	45	46	47	48	51	54	58
Program Graduates												
04 Raw Value	75	.48	.29	.10	.19	.24	.30	.44	.59	.67	.81	.87
Std Value	75	50	10	37	40	42	44	49	54	57	61	63
05 Raw Value	71	6.1	.8	7.0	6.5	6.3	6.2	6.0	5.9	5.8	5.5	5.3
Std Value	71	50	10	39	45	48	49	51	53	54	58	60
06 Raw Value	76	.80	.12	.65	.70	.75	.80	.82	.83	.87	.91	.93
Std Value	76	50	10	38	42	46	50	52	53	56	59	61
07 Raw Value	76	.48	.18	.25	.33	.40	.45	.50	.53	.57	.62	.72
Std Value	76	50	10	37	42	46	48	51	53	55	58	63
Survey Results												
08 Raw Value	131	2.8	.8	1.8	2.2	2.4	2.6	2.7	3.0	3.2	3.6	4.0
Std Value	131	50	10	37	42	45	47	48	52	55	60	65
09 Raw Value	125	1.8	.4	1.3	1.4	1.6	1.7	1.7	1.9	2.0	2.2	2.3
Std Value	125	50	10	38	41	46	48	48	53	55	60	63
10 Raw Value	116	1.2	.3	.8	1.0	1.1	1.1	1.2	1.2	1.3	1.4	1.5
Std Value	116	50	10	35	43	47	47	51	51	55	58	62
11 Raw Value	134	.6	.3	.2	.4	.4	.5	.6	.7	.7	.9	1.1
Std Value	134	50	10	37	43	43	46	49	52	52	58	64
University Library												
12 Raw Value	85	.3	.9	-.8	-.5	-.4	-.1	.2	.4	.8	.9	1.8
Std Value	85	50	10	38	42	43	46	49	51	55	56	66
Research Support												
13 Raw Value	102	.45	.23	.16	.22	.30	.37	.46	.51	.56	.65	.77
Std Value	102	50	10	37	40	43	47	50	53	55	59	64
14 Raw Value	108	8449	6012	2612	3161	4359	5391	6462	7807	9900	14096	17682
Std Value	108	50	10	40	41	43	45	47	49	52	59	65
Publication Records												
15 Raw Value	129	46	40	7	10	17	26	37	43	54	83	100
Std Value	129	50	10	40	41	43	45	48	49	52	59	63
16 Std Value	129	50	10	42	42	43	45	46	48	50	58	63

NOTE: Standardized values reported in the preceding table have been computed from exact values of the mean and standard deviation and not the rounded values reported here. Since the scale used to compute measure 16 is entirely arbitrary, only data in standardized form are reported for this measure.

TABLE 6.3 Intercorrelations Among Program Measures on 134 Programs in Microbiology

	Measure															
	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16
Program Size																
01		.61	.64	.12	.05	.00	.03	.50	.50	.42	.51	.23	.07	.24	.44	.38
02			.80	.18	.02	.07	.12	.48	.55	.19	.58	.27	.20	.18	.44	.29
03				.17	.06	.02	.04	.42	.46	.15	.50	.22	.14	.08	.29	.18
Program Graduates																
04					.09	.37	.37	.57	.54	.07	.48	.41	.42	.43	.52	.51
05						.33	.41	.08	.12	.19	.13	-.03	.00	.05	.02	-.03
06							.58	.23	.30	.16	.24	.08	.25	.12	.10	.13
07								.38	.37	.12	.31	.13	.35	.27	.26	.27
Survey Results																
08									.96	.46	.91	.54	.64	.68	.72	.75
09										.46	.90	.54	.65	.65	.69	.68
10											.39	.23	.26	.12	.27	.27
11												.39	.61	.50	.63	.62
University Library																
12													.16	.48	.63	.54
Research Support																
13														.29	.39	.40
14															.73	.78
Publication Records																
15																.90
16																

NOTE: Since in computing correlation coefficients program data must be available for both of the measures being correlated, the actual number of programs on which each coefficient is based varies.

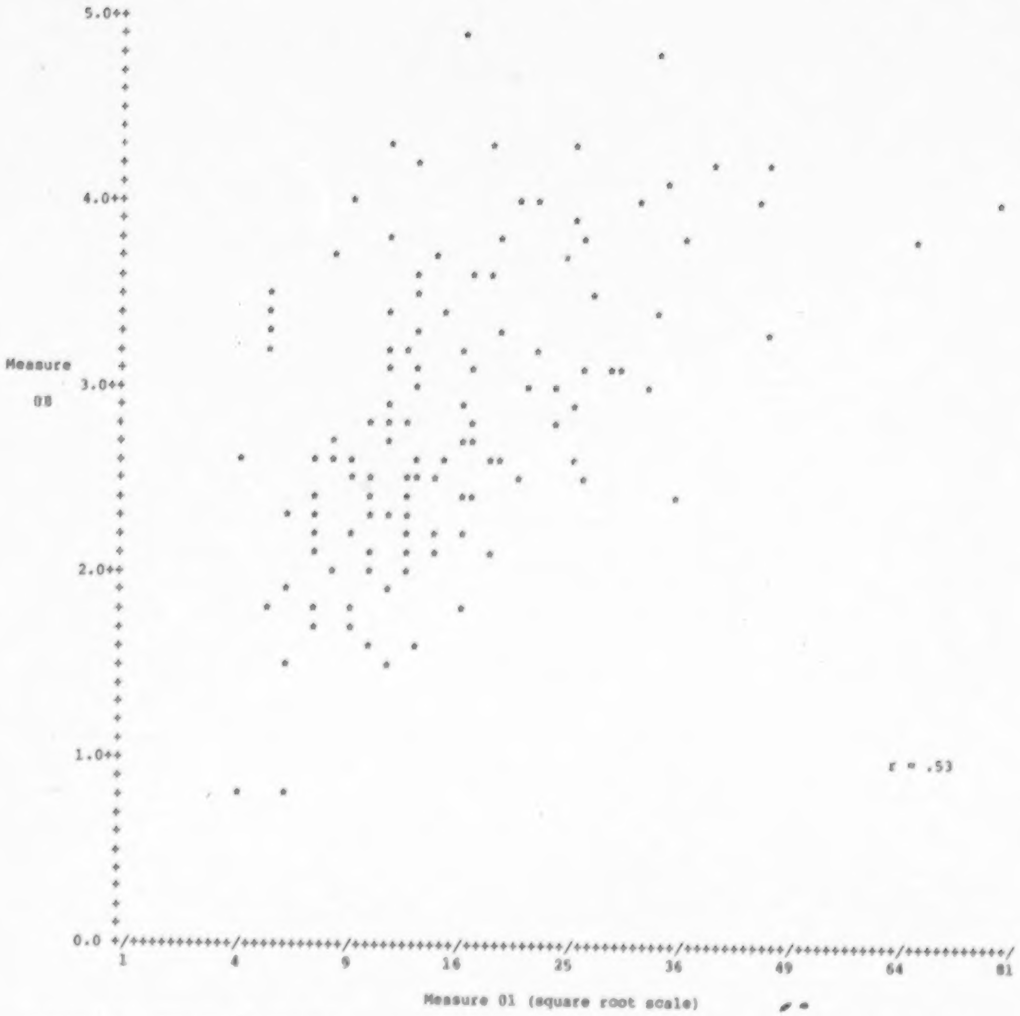

FIGURE 6.1 Mean rating of scholarly quality of faculty (measure 08) versus number of faculty members (measure 01)--131 programs in microbiology.

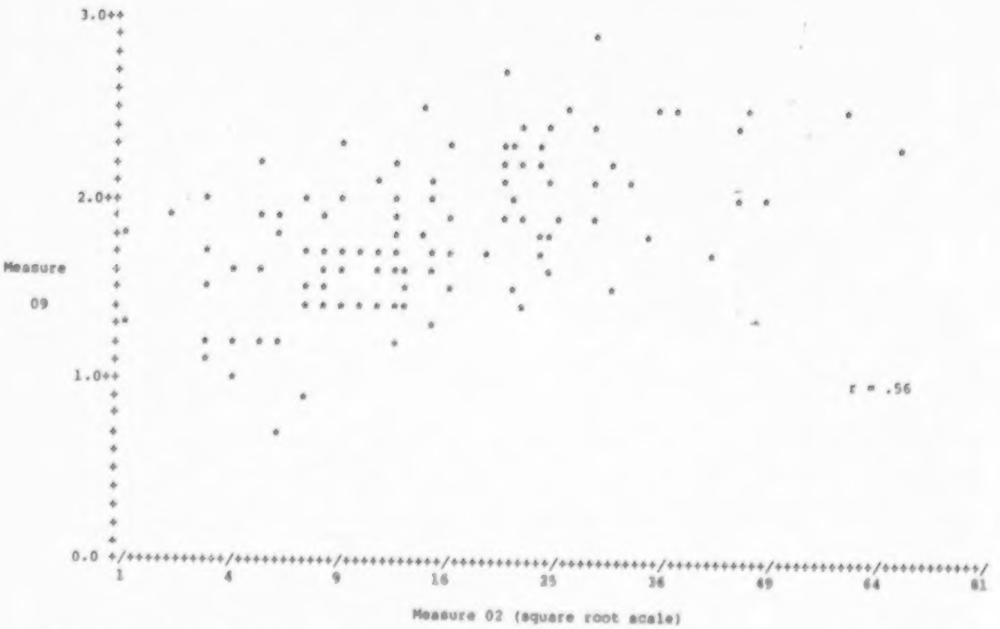

FIGURE 6.2 Mean rating of program effectiveness in educating research scholars/scientists (measure 09) versus number of graduates in last five years (measure 02)--123 programs in microbiology.

TABLE 6.4 Characteristics of Survey Participants in Microbiology

	Respondents	
	N	%
Field of Specialization		
Immunology	49	21
Microbiology/Bacteriology	108	47
Molecular Biology	32	14
Other/Unknown	42	18
Faculty Rank		
Professor	116	50
Associate Professor	65	28
Assistant Professor	50	22
Year of Highest Degree		
Pre-1950	11	5
1950-59	55	24
1960-69	89	39
Post-1969	76	33
Evaluator Selection		
Nominated by Institution	196	85
Other	35	15
Survey Form		
With Faculty Names	213	92
Without Names	18	8
Total Evaluators	231	100

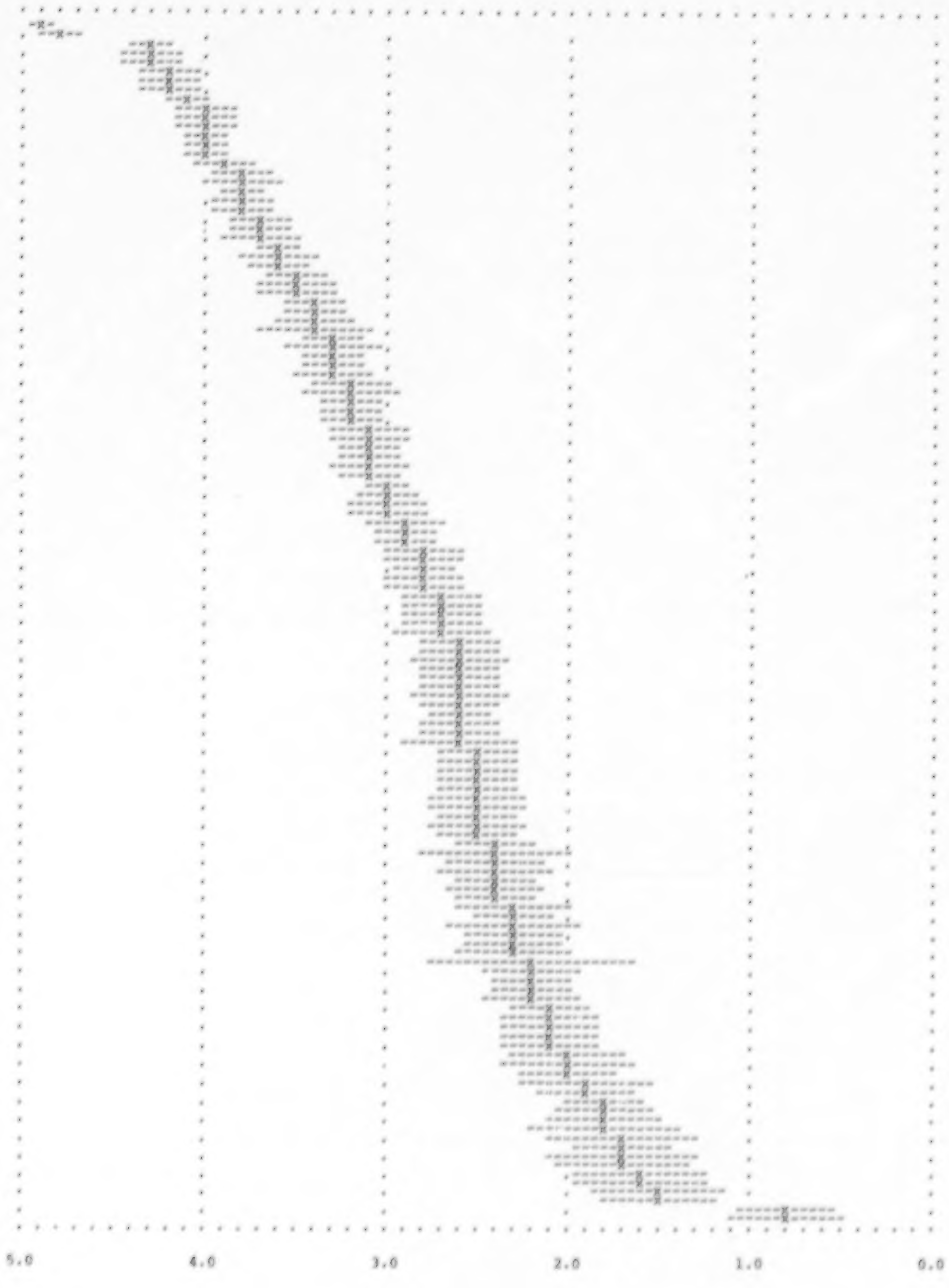

FIGURE 6.3 Mean rating of scholarly quality of faculty in 131 programs in microbiology.

NOTE: Programs are listed in sequence of mean rating, with the highest-rated program appearing at the top of the page. The broken lines (---) indicate a confidence interval of ±1.5 standard errors around the reported mean (x) of each program.

VII
Physiology Programs

In this chapter 101 research-doctorate programs in physiology are assessed. These programs, according to the information supplied by their universities, have accounted for 1,369 doctoral degrees awarded during the FY1976-80 period--approximately 87 percent of the aggregate number of physiology doctorates earned from U.S. universities in this five-year span.[1] Because physiology programs may be found in a variety of settings within universities, the committee encountered difficulty in identifying a comprehensive set of research-doctorate programs that have produced graduates in this discipline. On the average, 16 full-time and part-time students intending to earn doctorates were enrolled in a program in December 1980, with an average faculty size of 19 members.[2] Most of the 101 programs, listed in Table 7.1, are located in departments within schools of medicine. Six programs were initiated since 1970. Each of seven institutions--University of Arizona, University of California (San Diego), Iowa State University, University of Kansas, Ohio State University, Oklahoma State University, and SUNY at Buffalo--has two physiology programs included in the assessment. The University of Minnesota has three programs evaluated in this discipline. In addition to the 92 institutions represented in this discipline, another 11 were initially identified as meeting the criteria[3] for inclusion in the assessment:

University of California--Riverside
CUNY--Graduate School
Florida State University--Tallahassee
Massachusetts Institute of Technology

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[1] Data from the NRC's Survey of Earned Doctorates indicate that 1,570 research doctorates in physiology were awarded by U.S. universities between FY1976 and FY1980.

[2] See the reported means for measures 03 and 01 in Table 7.2.

[3] As mentioned in Chapter I, the primary criterion for inclusion was that a university had awarded at least 11 doctorates in physiology during the FY1976-78 period.

University of Massachusetts--Amherst
University of Nebraska--Lincoln
University of New Mexico--Albuquerque
Oregon State University
Princeton University
University of Mississippi--Medical Center
University of Texas--Health Science Center, Dallas

The latter two institutions chose not to participate in the assessment in any discipline. Physiology programs at the other nine institutions have not been included in the evaluations in this discipline, since in each case the study coordinator either indicated that the institution did not at that time have a research-doctorate program in physiology or failed to provide the information requested by the committee.

Before examining individual program results presented in Table 7.1, the reader is urged to refer to Chapter II, in which each of the 16 measures used in the assessment is discussed. Summary statistics describing every measure are given in Table 7.2. For seven of the measures, data are reported for at least 94 of the 101 physiology programs. For measures 04-07, which pertain to characteristics of the program graduates, data are presented for slightly less than half of the programs; the other programs had too few graduates on which to base statistics.* For measure 12, a composite index of the size of a university library, data are available for 71 programs. With respect to measure 13, the fraction of faculty with research grants from the National Institutes of Health, the National Science Foundation, or the Alcohol, Drug Abuse, and Mental Health Administration, data are reported for 80 programs that had at least 10 faculty members. For measure 14, the total university expenditures for research in the biological sciences, data are available for 88 programs. The programs not evaluated on measures 12, 13, and 14 are typically smaller--in terms of faculty size and graduate student enrollment--than other physiology programs. Were data on these three measures available for all 101 programs, it is likely that their reported means would be appreciably lower (and that some of the correlations of these measures with others would be higher). With regard to reputational survey measures 09 and 10, results were not reported for any programs with fewer than 15 ratings.

Intercorrelations among the 16 measures (Pearson product-moment coefficients) are given in Table 7.3. Of particular note are the high positive correlations of reputational survey ratings (08, 09) with measures of publication records (15, 16) and number of program faculty (01). Figure 7.1 illustrates the relation between the mean rating of the scholarly quality of faculty (measure 08) and the number of faculty members (measure 01) for each of 94 programs in physiology. Figure 7.2

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*As mentioned in Chapter II, data for measures 04-07 are not reported if they are based on the survey responses of fewer than 10 FY1975-79 program graduates.

plots the mean rating of program effectiveness (measure 09) against the total number of FY1976-80 program graduates (measure 02). Although in both figures there is a significant positive correlation between program size and reputational rating, it is quite apparent that some of the smaller programs received high mean ratings.

Table 7.4 describes the 146 faculty members who participated in the evaluation of physiology programs. These individuals constituted 48 percent of those asked to respond to the survey in this discipline and 7 percent of the faculty population in the 101 research-doctorate programs being evaluated.[5] More than two-thirds of the survey participants had earned their highest degree prior to 1970, and almost half held the rank of full professor.

One exception should be noted with regard to the survey evaluations in this discipline. It has been called to the attention of the committee that the University of Arizona's research-doctorate program in the physiology department in the College of Medicine was incorrectly identified as "Physiology (Human)." The committee has decided to report the survey results for this program but cautions that the reputational ratings may possibly have been influenced by the use of an inaccurate program title on the survey form.

To assist the reader in interpreting results of the survey evaluations, estimated standard errors have been computed for mean ratings of the scholarly quality of faculty in 94 physiology programs (and are given in Table 7.1). For each program the mean rating and an associated "confidence interval" of 1.5 standard errors are illustrated in Figure 7.3 (listed in order of highest to lowest mean rating). In comparing two programs, if their confidence intervals do not overlap, one may conclude that there is a significant difference in their mean ratings at a .05 level of significance.[6] From this figure it is also apparent that one should have somewhat more confidence in the accuracy of the mean ratings of higher-rated programs than lower-rated programs. This generalization results primarily from the fact that evaluators are not as likely to be familiar with the less prestigious programs, and consequently the mean ratings of these programs are usually based on fewer survey responses.

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[5] See Table 2.3 in Chapter II.

[6] See pp. 31-33 for a discussion of the interpretation of mean ratings and associated confidence intervals.

TABLE 7.1 Program Measures (Raw and Standardized Values) in Physiology

Prog No.	University - Department/Academic Unit	Program Size (01)	(02)	(03)	Characteristics of Program Graduates (04)	(05)	(06)	(07)
001.	Alabama, University of-Birmingham *Physiology*	32 *59*	22 *58*	14 *49*	.31 *41*	8.0 *29*	.79 *48*	.71 *60*
002.	Albany Medical College *Physiology*	14 *46*	10 *47*	13 *48*	NA	NA	NA	NA
003.	Albert Einstein College of Medicine *Physiology*	14 *46*	3 *40*	3 *41*	NA	NA	NA	NA
004.	Arizona, University of-Tucson *Animal Physiology*	11 *44*	11 *48*	15 *49*	NA	NA	NA	NA
005.	Arizona, University of-Tucson *Physiology (College of Medicine)*	13 *45*	12 *49*	13 *48*	NA	NA	NA	NA
006.	Baylor College of Medicine-Houston *Physiology*	15 *47*	13 *49*	4 *42*	NA	NA	NA	NA
007.	Brown University *Biology and Medicine*	17 *48*	7 *44*	10 *46*	NA	NA	NA	NA
008.	California, University of-Irvine *Physiol & Biophys/Developmental & Cell Biol*	17 *48*	7 *44*	8 *44*	NA	NA	NA	NA
009.	California, University of-Berkeley *Physiology*	14 *46*	29 *64*	48 *72*	.67 *55*	6.6 *44*	.78 *47*	.52 *47*
010.	California, University of-Davis *Physiology*	74 *90*	44 *78*	40 *67*	.33 *42*	6.3 *49*	.83 *52*	.66 *56*
011.	California, University of-Los Angeles *Physiology*	36 *62*	15 *51*	11 *47*	.90 *64*	5.1 *62*	.84 *54*	.79 *65*
012.	California, University of-San Diego *Biology*	7 *41*	8 *45*	10 *46*	NA	NA	NA	NA
013.	California, University of-San Diego *Physiology/Pharmacology**	12 *45*	8 *45*	41 *67*	NA	NA	NA	NA
014.	California, University of-San Francisco *Physiology*	50 *72*	23 *59*	9 *45*	.60 *53*	6.8 *42*	.95 *64*	.75 *62*
015.	Case Western Reserve University *Physiology*	9 *42*	5 *42*	5 *42*	NA	NA	NA	NA
016.	Chicago, University of *Pharmacological and Physiological Sciences*	23 *53*	20 *56*	25 *56*	NA	NA	NA	NA
017.	Cincinnati, University of *Physiology*	12 *45*	14 *50*	11 *47*	.20 *37*	5.0 *63*	.90 *59*	.70 *59*
018.	Colorado State University-Fort Collins *Physiology and Biophysics*	22 *52*	8 *45*	18 *51*	NA	NA	NA	NA
019.	Colorado, University of *Physiology*	12 *45*	2 *39*	1 *40*	NA	NA	NA	NA
020.	Columbia University *Physiology*	23 *53*	7 *44*	15 *49*	NA	NA	NA	NA

* indicates program was initiated since 1970.

NOTE: On the first line of data for every program, raw values for each measure are reported; on the second line values are reported in standardized form, with mean = 50 and standard deviation = 10. "NA" indicates that the value for a measure is not available.

TABLE 7.1 Program Measures (Raw and Standardized Values) in Physiology

Prog No.	Survey Results				University Library	Research Support		Published Articles		Survey Ratings Standard Error			
	(08)	(09)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(08)	(09)	(10)	(11)
001.	3.4	2.0	1.7	0.7	NA	.56	4467	40		.14	.10	.09	.08
	55	54	71	53		52	43	62	60				
002.	2.6	1.8	1.1	0.5	NA	.64	3066	10		.21	.10	.14	.08
	45	49	48	47		55	41	46	45				
003.	3.6	2.0	1.1	0.8	NA	.71	9184	17		.13	.11	.12	.08
	58	53	46	56		58	51	50	52				
004.	NA	NA	NA	0.2	0.9	.00	7828	4		NA	NA	NA	.06
				37	56	28	49	43	43				
005.	3.3	2.0	1.4	0.7	0.9	.62	7828	13		.13	.09	.11	.08
	53	53	61	54	56	54	49	48	47				
006.	2.9	1.6	0.9	0.5	NA	.27	14051	11		.18	.14	.15	.07
	49	43	39	48		39	59	47	48				
007.	3.3	1.9	1.1	0.6	-1.1	.59	NA	11		.12	.08	.10	.08
	54	51	48	52	37	53		47	47				
008.	3.1	2.1	1.5	0.6	NA	.77	6547	14		.15	.14	.15	.09
	52	56	65	50		60	47	48	48				
009.	3.4	2.1	0.9	0.9	2.2	.79	18977	23		.12	.12	.07	.09
	55	56	39	61	69	61	67	53	51				
010.	3.7	2.3	1.5	1.0	0.6	.42	18053	26		.13	.08	.10	.09
	60	62	66	62	54	46	65	55	51				
011.	4.3	2.3	1.1	1.3	2.0	.64	15581	75		.09	.07	.07	.08
	67	63	49	73	67	55	61	82	82				
012.	2.8	1.8	NA	0.3	-0.0	NA	8706	16		.29	.14	NA	.07
	47	49		42	47		50	49	49				
013.	3.7	2.0	1.5	0.8	-0.0	.83	8706	36		.15	.10	.11	.08
	59	53	64	56	47	63	50	60	55				
014.	4.5	2.5	1.4	1.4	NA	.78	13194	77		.09	.08	.08	.08
	70	67	59	77		61	57	83	83				
015.	2.7	1.3	0.6	0.4	-1.3	NA	7721	1		.15	.14	.14	.07
	46	35	27	45	35		48	41	42				
016.	3.6	2.1	1.2	1.0	0.9	.78	17569	29		.14	.11	.14	.07
	58	57	50	63	56	61	64	56	59				
017.	2.7	1.8	1.3	0.4	-0.2	.75	9365	9		.18	.13	.13	.07
	46	48	56	45	45	60	51	45	47				
018.	3.2	2.1	1.4	0.4	-1.1	.41	8863	3		.19	.13	.12	.08
	52	56	60	45	37	45	50	42	42				
019.	3.0	1.5	1.3	0.5	-0.9	.83	11967	39		.20	.16	.11	.08
	50	41	56	45	39	63	55	62	63				
020.	4.0	2.1	1.2	0.9	1.7	.70	11090	27		.09	.09	.09	.08
	63	58	53	61	65	57	54	55	54				

NOTE: On the first line of data for every program, raw values for each measure are reported; on the second line values are reported in standardized form, with mean = 50 and standard deviation = 10. "NA" indicates that the value for a measure is not available. Since the scale used to compute measure 16 is entirely arbitrary, only values in standardized form are reported for this measure.

TABLE 7.1 Program Measures (Raw and Standardized Values) in Physiology

Prog No.	University - Department/Academic Unit	Program Size (01)	Program Size (02)	Program Size (03)	Characteristics of Program Graduates (04)	Characteristics of Program Graduates (05)	Characteristics of Program Graduates (06)	Characteristics of Program Graduates (07)
021.	Connecticut, University of-Storrs	7	8	9	.39	6.8	.85	.69
	Biological Sciences	*41*	*45*	*45*	*44*	*43*	*54*	*58*
022.	Cornell University-Ithaca	34	12	13	.45	6.7	.75	.45
	Physiology	*61*	*49*	*48*	*47*	*44*	*45*	*42*
023.	Cornell University-Medical Center	8	6	6	NA	NA	NA	NA
	Physiology	*42*	*43*	*43*				
024.	Duke University	37	39	28	.84	5.4	.75	.57
	Physiology	*63*	*74*	*58*	*62*	*59*	*44*	*50*
025.	Emory University	10	8	10	.70	6.5	NA	NA
	Physiology	*43*	*45*	*46*	*57*	*46*		
026.	Florida, University of-Gainesville	15	7	9	NA	NA	NA	NA
	Physiology (Human)	*47*	*44*	*45*				
027.	Georgetown University	13	18	21	.43	5.2	.71	.21
	Physiology and Biophysics	*45*	*54*	*53*	*46*	*61*	*41*	*26*
028.	Georgia, University of-Athens	10	6	7	NA	NA	NA	NA
	Physiology and Pharmacology	*43*	*43*	*44*				
029.	Harvard University	46	54	76	.57	6.1	.77	.56
	Biology (Organismic & Evolutionary)	*69*	*88*	*92*	*51*	*51*	*46*	*49*
030.	Hawaii, University of	13	17	15	.09	5.3	.91	.55
	Physiology	*45*	*53*	*49*	*32*	*59*	*60*	*48*
031.	Houston, University of	7	11	6	.10	7.5	.80	.50
	Biology	*41*	*48*	*43*	*33*	*34*	*50*	*45*
032.	Howard University	18	10	12	NA	NA	NA	NA
	Physiology	*49*	*47*	*47*				
033.	Illinois, University of-Medical Center	25	25	32	.56	6.6	.87	.73
	Physiology and Biophysics	*54*	*61*	*61*	*51*	*44*	*56*	*61*
034.	Illinois, University-Urbana/Champaign	35	31	78	.77	6.5	.77	.59
	Physiology and Biophysics	*61*	*66*	*93*	*60*	*46*	*47*	*52*
035.	Indiana State University-Terre Haute	10	6	7	NA	NA	NA	NA
	Life Sciences	*43*	*43*	*44*				
036.	Indiana University-Bloomington	9	12	7	NA	NA	NA	NA
	Physiology	*42*	*49*	*44*				
037.	Indiana University-Purdue University	15	13	11	NA	NA	NA	NA
	Physiology	*47*	*49*	*47*				
038.	Iowa State University-Ames	8	8	25	NA	NA	NA	NA
	Animal Science	*42*	*45*	*56*				
039.	Iowa State University-Ames	18	1	16	NA	NA	NA	NA
	Veterinary Physiology and Pharmacology	*49*	*38*	*50*				
040.	Iowa, University of-Iowa City	23	13	10	.79	5.0	.90	.79
	Physiology and Biophysics	*53*	*49*	*46*	*60*	*63*	*59*	*65*

* indicates program was initiated since 1970.

NOTE: On the first line of data for every program, raw values for each measure are reported; on the second line values are reported in standardized form, with mean = 50 and standard deviation = 10. "NA" indicates that the value for a measure is not available.

TABLE 7.1 Program Measures (Raw and Standardized Values) in Physiology

Prog No.	Survey Results				University Library	Research Support		Published Articles		Survey Ratings Standard Error			
	(08)	(09)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(08)	(09)	(10)	(11)
021.	2.5	1.3	1.1	0.3	-0.5	NA	15199	2		.17	.18	.17	.06
	43	*36*	*46*	*42*	*43*		*61*	*42*	*43*				
022.	3.5	2.2	1.2	0.7	1.6	.41	14597	15		.14	.09	.12	.08
	57	*60*	*52*	*52*	*63*	*45*	*60*	*49*	*50*				
023.	3.2	1.9	1.0	0.6	NA	NA	14597	5		.13	.08	.11	.08
	53	*52*	*42*	*51*			*60*	*43*	*43*				
024.	3.9	2.4	1.0	1.2	0.3	.65	11320	34		.10	.06	.10	.08
	63	*64*	*44*	*69*	*51*	*55*	*54*	*59*	*62*				
025.	2.7	1.7	0.8	0.6	-0.6	.90	2874	14		.13	.10	.14	.07
	46	*45*	*33*	*51*	*42*	*66*	*41*	*48*	*48*				
026.	2.9	1.8	1.2	0.8	0.8	.47	3486	20		.13	.10	.11	.08
	48	*48*	*52*	*56*	*55*	*48*	*42*	*52*	*49*				
027.	2.8	1.8	1.0	0.5	-0.6	.46	4200	10		.21	.12	.10	.08
	48	*48*	*43*	*46*	*41*	*47*	*43*	*46*	*46*				
028.	2.0	NA	NA	0.3	0.4	.00	10714	3		.27	NA	NA	.07
	36			*40*	*52*	*28*	*53*	*42*	*42*				
029.	4.1	2.5	1.1	0.8	3.0	.74	34979	6		.15	.08	.12	.09
	65	*67*	*49*	*55*	*77*	*59*	*93*	*44*	*44*				
030.	2.6	1.5	NA	0.3	-0.1	.39	4440	3		.22	.16	NA	.06
	44	*41*		*41*	*46*	*44*	*43*	*42*	*42*				
031.	1.6	NA	NA	0.2	-0.9	NA	NA	2		.26	NA	NA	.05
	31			*36*	*39*			*42*	*43*				
032.	2.1	1.3	1.3	0.4	-0.4	.06	NA	1		.19	.16	.18	.07
	38	*34*	*55*	*42*	*44*	*30*		*41*	*42*				
033.	3.0	1.8	1.1	0.6	NA	.44	4393	33		.14	.10	.14	.07
	49	*49*	*45*	*50*		*47*	*43*	*59*	*58*				
034.	3.8	2.2	1.4	1.0	2.0	.74	6074	5		.12	.09	.12	.09
	61	*59*	*59*	*63*	*67*	*59*	*46*	*43*	*42*				
035.	1.1	NA	NA	0.2	NA	.10	NA	0		.28	NA	NA	.05
	24			*37*		*32*		*41*	*41*				
036.	2.6	1.6	0.8	0.4	0.9	NA	NA	1		.15	.10	.14	.07
	44	*44*	*33*	*45*	*57*			*41*	*42*				
037.	3.4	1.9	1.0	0.9	NA	.60	2940	NA		.14	.09	.11	.09
	56	*52*	*43*	*59*		*53*	*41*		*NA*				
038.	2.5	1.5	NA	0.3	-0.5	NA	5287	8		.30	.24	NA	.07
	43	*40*		*40*	*43*		*44*	*45*	*43*				
039.	2.6	1.5	NA	0.3	-0.5	.06	5287	8		.26	.19	NA	.07
	44	*41*		*42*	*43*	*30*	*44*	*45*	*43*				
040.	3.4	2.1	1.3	1.1	0.3	.70	7088	48		.12	.09	.11	.08
	56	*57*	*56*	*65*	*50*	*57*	*47*	*67*	*61*				

NOTE: On the first line of data for every program, raw values for each measure are reported; on the second line values are reported in standardized form, with mean = 50 and standard deviation = 10. "NA" indicates that the value for a measure is not available. Since the scale used to compute measure 16 is entirely arbitrary, only values in standardized form are reported for this measure.

TABLE 7.1 Program Measures (Raw and Standardized Values) in Physiology

Prog No.	University - Department/Academic Unit	Program Size (01)	(02)	(03)	Characteristics of Program Graduates (04)	(05)	(06)	(07)
041.	Johns Hopkins University	10	8	8	.90	NA	.80	.60
	Physiology	*43*	*45*	*44*	*65*		*50*	*52*
042.	Kansas State University-Manhattan	9	7	12	NA	NA	NA	NA
	Anatomy and Physiology	*42*	*44*	*47*				
043.	Kansas, University of	17	5	9	NA	NA	NA	NA
	Physiology (Schl of Medicine-Kansas City)	*48*	*42*	*45*				
044.	Kansas, University of	11	12	4	.06	7.2	.67	.33
	Physiology and Cell Biology (Graduate Schl)	*44*	*49*	*42*	*31*	*38*	*36*	*34*
045.	Kent State University	16	9	30	NA	NA	NA	NA
	Biological Sciences	*48*	*46*	*60*				
046.	Kentucky, University of	19	9	10	NA	NA	NA	NA
	Physiology and Biophysics	*50*	*46*	*46*				
047.	Louisiana State University-Baton Rouge	5	3	6	NA	NA	NA	NA
	*Zoology and Physiology**	*40*	*40*	*43*				
048.	Louisiana State Univ-School of Medicine	37	12	17	NA	NA	NA	NA
	Physiology and Biophysics	*63*	*49*	*51*				
049.	Louisville, University of	9	8	6	NA	NA	NA	NA
	Physiology	*42*	*45*	*43*				
050.	Loyola University of Chicago	8	6	14	NA	NA	NA	NA
	Physiology	*42*	*43*	*49*				
051.	Maryland, University of-College Park	6	8	11	NA	NA	NA	NA
	*Animal Sciences**	*40*	*45*	*47*				
052.	Medical College of Wisconsin	9	19	7	.55	5.5	.78	.67
	Physiology	*42*	*55*	*44*	*51*	*57*	*47*	*57*
053.	Medical University of South Carolina	14	6	4	NA	NA	NA	NA
	Physiology	*46*	*43*	*42*				
054.	Miami, University of-Florida	15	8	8	.46	6.1	.54	.39
	Physiology and Biophysics	*47*	*45*	*44*	*47*	*50*	*24*	*38*
055.	Michigan State University-East Lansing	34	33	19	.19	6.3	.84	.61
	Physiology	*61*	*68*	*52*	*36*	*48*	*53*	*53*
056.	Michigan, University of-Ann Arbor	22	27	20	.78	6.1	.87	.61
	Physiology	*52*	*63*	*53*	*60*	*50*	*56*	*53*
057.	Minnesota, University of	6	5	8	NA	NA	NA	NA
	Animal Sci/Ecol & Behav Biol/Gen & Cell Bio	*40*	*42*	*44*				
058.	Minnesota, University of	13	2	5	NA	NA	NA	NA
	Physiol & Biophysics Mayo Grad Sch of Med)	*45*	*39*	*42*				
059.	Minnesota, University of	24	17	35	.67	9.0	.64	.36
	Physiology (Graduate School)	*53*	*53*	*63*	*55*	*17*	*34*	*36*
060.	Missouri, University of-Columbia	15	21	15	.52	6.5	.75	.46
	Physiology	*47*	*57*	*49*	*49*	*46*	*45*	*43*

* indicates program was initiated since 1970.

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TABLE 7.1 Program Measures (Raw and Standardized Values) in Physiology

Prog No.	Survey Results				University Library	Research Support		Published Articles		Survey Ratings Standard Error			
	(08)	(09)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(08)	(09)	(10)	(11)
041.	3.5	2.0	0.7	0.7	-0.4	.70	19837	45		.15	.09	.10	.08
	56	53	30	53	44	58	68	65	61				
042.	2.2	NA	NA	0.3	NA	NA	2496	2		.31	NA	NA	.06
	39			40			40	42	42				
043.	2.8	1.6	1.2	0.5	0.1	.53	3161	18		.16	.12	.10	.07
	47	44	53	48	49	50	41	50	49				
044.	2.1	1.5	1.0	0.3	0.1	.36	3161	1		.22	.14	.12	.06
	38	40	43	40	49	43	41	41	42				
045.	NA	NA	NA	0.2	-1.8	.06	NA	1		NA	NA	NA	.05
				36	30	31		41	42				
046.	2.6	1.6	1.0	0.5	-0.1	.42	484	6		.17	.12	.17	.07
	44	43	43	45	47	46	37	44	44				
047.	1.3	NA	NA	0.2	-0.3	NA	5116	3		.23	NA	NA	.05
	26			36	44		44	42	42				
048.	3.0	1.8	1.6	0.7	NA	.35	5116	5		.14	.10	.11	.09
	49	49	68	54		43	44	43	43				
049.	2.0	1.1	NA	0.3	NA	NA	NA	0		.17	.12	NA	.06
	36	30		42				41	41				
050.	2.6	1.6	1.0	0.5	NA	NA	NA	10		.17	.13	.13	.09
	45	43	41	48				46	47				
051.	NA	NA	NA	0.1	0.2	NA	1623	1		NA	NA	NA	.04
				34	49		39	41	42				
052.	2.2	1.4	1.3	0.4	NA	NA	2085	9		.18	.17	.17	.08
	40	37	54	45			39	45	45				
053.	2.3	1.4	NA	0.4	NA	.43	3178	3		.23	.17	NA	.07
	40	38		43		46	41	42	43				
054.	3.3	1.7	1.3	0.6	NA	.53	6101	10		.14	.13	.13	.08
	54	45	56	52		50	46	46	47				
055.	3.5	2.2	1.3	1.0	0.3	.38	10357	17		.11	.10	.12	.09
	57	59	56	62	51	44	53	50	50				
056.	4.1	2.3	1.2	1.2	1.8	.77	15431	35		.11	.08	.08	.08
	65	62	50	71	65	61	61	60	59				
057.	1.8	1.1	NA	0.3	1.2	NA	13696	NA		.24	.19	NA	.07
	34	30		40	53		58		NA				
058.	3.7	2.1	1.2	0.8	1.2	.00	13696	29		.14	.15	.12	.09
	60	56	50	56	59	28	58	56	56				
059.	3.5	1.9	1.1	0.8	1.2	.63	13696	12		.14	.10	.12	.09
	57	53	48	57	59	54	58	47	48				
060.	3.6	2.2	1.1	0.7	-0.2	.60	4628	NA		.12	.08	.10	.09
	58	60	48	54	46	53	43		NA				

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TABLE 7.1 Program Measures (Raw and Standardized Values) in Physiology

Prog No.	University - Department/Academic Unit	Program Size (01)	Program Size (02)	Program Size (03)	Characteristics of Program Graduates (04)	Characteristics of Program Graduates (05)	Characteristics of Program Graduates (06)	Characteristics of Program Graduates (07)
061.	New Jersey, College of Medicine & Dentistry	15	8	12	NA	NA	NA	NA
	*Physiology**	*47*	*45*	*47*				
062.	New York University	25	5	6	NA	NA	NA	NA
	Basic Medical Sciences	*54*	*42*	*43*				
063.	North Carolina State University-Raleigh	19	14	15	.42	6.0	.83	.25
	Physiology	*50*	*50*	*49*	*45*	*52*	*53*	*28*
064.	North Carolina, University of-Chapel Hill	77	9	21	NA	NA	NA	NA
	Physiology	*92*	*46*	*53*				
065.	North Dakota, University of-Grand Forks	6	11	7	.92	4.5	.75	.67
	Physiology	*40*	*48*	*44*	*65*	*69*	*45*	*57*
066.	Northwestern University	27	15	37	.53	5.8	.77	.53
	Physiology/Pharmacology/Pathology/Biol Sci	*55*	*51*	*65*	*50*	*54*	*46*	*47*
067.	Ohio State University-Columbus	20	23	22	.56	5.3	.61	.33
	Physiology	*50*	*59*	*54*	*51*	*60*	*31*	*34*
068.	Ohio State University-Columbus	6	10	5	NA	NA	NA	NA
	Veterinary Physiology and Pharmacology	*40*	*47*	*42*				
069.	Oklahoma State University-Stillwater	16	71	12	.24	4.5	.95	.67
	Animal Science	*48*	*99*	*47*	*38*	*70*	*65*	*57*
070.	Oklahoma State University-Stillwater	17	9	8	NA	NA	NA	NA
	Physiological Sciences	*48*	*46*	*44*				
071.	Oklahoma, University of-Norman	13	8	7	NA	NA	NA	NA
	Physiology and Biostatistics	*45*	*45*	*44*				
072.	Oregon, University of-Eugene	12	3	7	NA	NA	NA	NA
	Biology	*45*	*40*	*44*				
073.	Pennsylvania State University	37	34	35	.33	5.5	.68	.42
	Physiology (Grad School and Medical Center)	*63*	*69*	*63*	*42*	*57*	*38*	*40*
074.	Pennsylvania, University of	46	14	30	.75	7.0	.88	.56
	Physiology	*69*	*50*	*60*	*59*	*40*	*57*	*50*
075.	Purdue University-West Lafayette	13	26	28	.46	5.7	.91	.76
	Biological Sciences	*45*	*62*	*58*	*47*	*55*	*60*	*63*
076.	Rochester, University of	13	10	16	.83	7.2	.92	.58
	Physiology	*45*	*47*	*50*	*62*	*38*	*61*	*51*
077.	Rockefeller University	40	20	26	.56	5.5	.81	.75
	Physiology	*65*	*56*	*57*	*51*	*58*	*51*	*62*
078.	Rutgers, The State University-New Brunswick	26	21	72	.09	6.5	.82	.55
	Physiology	*55*	*57*	*89*	*32*	*46*	*51*	*48*
079.	SUNY Upstate Medical Center	13	9	7	NA	NA	NA	NA
	Physiology	*45*	*46*	*44*				
080.	SUNY at Buffalo	15	10	16	NA	NA	NA	NA
	Physiology (Roswell Park Graduate Division)	*47*	*47*	*50*				

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TABLE 7.1 Program Measures (Raw and Standardized Values) in Physiology

Prog No.	Survey Results				University Library	Research Support		Published Articles		Survey Ratings Standard Error			
	(08)	(09)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(08)	(09)	(10)	(11)
061.	2.6	1.6	1.1	0.3	NA	.47	4529	15		.21	.16	.13	.06
	44	*42*	*49*	*41*		*48*	*43*	*49*	*47*				
062.	3.3	1.8	1.4	0.6	0.5	.60	9934	11		.17	.15	.15	.09
	54	*48*	*61*	*51*	*52*	*53*	*52*	*47*	*49*				
063.	2.7	1.7	NA	0.3	NA	.26	6741	4		.24	.16	NA	.07
	45	*45*		*41*		*39*	*47*	*43*	*42*				
064.	3.8	2.1	1.4	1.0	1.0	.61	9849	29		.10	.09	.10	.08
	61	*57*	*61*	*62*	*57*	*54*	*52*	*56*	*56*				
065.	1.4	1.0	NA	0.3	NA	NA	NA	2		.23	.19	NA	.06
	28	*27*		*39*				*42*	*42*				
066.	3.4	2.0	1.7	0.8	0.3	.78	4760	19		.12	.10	.13	.09
	55	*54*	*73*	*55*	*50*	*61*	*44*	*51*	*52*				
067.	2.6	1.5	NA	0.4	0.9	.35	8330	8		.22	.14	NA	.08
	44	*41*		*44*	*56*	*43*	*49*	*45*	*44*				
068.	1.9	NA	NA	0.3	0.9	NA	8330	8		.30	NA	NA	.07
	35			*39*	*56*		*49*	*45*	*44*				
069.	NA	NA	NA	0.2	-1.9	.00	3127	4		NA	NA	NA	.05
				37	*29*	*28*	*41*	*43*	*43*				
070.	NA	NA	NA	0.2	-1.9	.35	3127	4		NA	NA	NA	.07
				38	*29*	*43*	*41*	*43*	*43*				
071.	2.3	1.4	1.1	0.5	-0.6	.46	NA	7		.15	.15	.19	.07
	40	*39*	*46*	*46*	*42*	*47*		*44*	*44*				
072.	3.0	1.9	1.2	0.4	-0.9	.58	NA	6		.25	.14	.10	.07
	50	*51*	*51*	*43*	*39*	*53*		*44*	*43*				
073.	3.5	2.1	1.3	0.7	0.7	.49	8024	32		.14	.08	.14	.09
	57	*58*	*57*	*54*	*54*	*48*	*49*	*58*	*54*				
074.	4.3	2.5	1.3	1.4	0.7	.70	23550	104		.10	.07	.08	.07
	67	*66*	*54*	*77*	*54*	*57*	*74*	*98*	*91*				
075.	3.1	1.9	1.0	0.5	-0.5	.85	10337	17		.17	.09	.15	.07
	51	*52*	*45*	*46*	*42*	*64*	*53*	*50*	*52*				
076.	3.4	2.2	0.9	0.8	-0.6	.85	15969	39		.13	.07	.08	.09
	55	*58*	*41*	*56*	*42*	*64*	*62*	*62*	*60*				
077.	4.3	2.6	1.2	1.0	NA	.73	27299	29		.09	.07	.09	.09
	68	*70*	*52*	*62*		*59*	*80*	*56*	*67*				
078.	3.1	2.0	1.1	0.7	0.8	.15	7505	5		.13	.06	.10	.08
	51	*53*	*48*	*52*	*55*	*34*	*48*	*43*	*44*				
079.	2.8	1.8	NA	0.4	NA	.54	NA	8		.15	.14	NA	.07
	47	*48*		*45*		*51*		*45*	*44*				
080.	NA	NA	NA	0.2	0.3	.00	6799	6		NA	NA	NA	.06
				38	*50*	*28*	*47*	*44*	*42*				

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TABLE 7.1 Program Measures (Raw and Standardized Values) in Physiology

Prog No.	University - Department/Academic Unit	Program Size (01)	(02)	(03)	Characteristics of Program Graduates (04)	(05)	(06)	(07)
081.	SUNY at Buffalo	29	15	9	.67	6.0	.83	.75
	Physiology (School of Medicine)	*57*	*51*	*45*	*55*	*52*	*53*	*62*
082.	SUNY-Downstate Medical Center	17	3	3	NA	NA	NA	NA
	Physiology	*48*	*40*	*41*				
083.	Southern California, University of	14	12	9	.67	6.5	.92	.50
	Physiology and Biophysics	*46*	*49*	*45*	*55*	*46*	*61*	*45*
084.	Stanford University	6	13	14	.75	6.0	.92	.75
	Physiology	*42*	*49*	*49*	*59*	*52*	*61*	*62*
085.	Temple University	8	7	9	.23	6.5	.58	.33
	Physiology	*42*	*44*	*45*	*38*	*46*	*28*	*34*
086.	Tennessee, Univ of-Ctr for Health Sciences	21	4	3	NA	NA	NA	NA
	Physiology & Biophysics	*51*	*41*	*41*				
087.	Texas, U of-Health Science Center, Houston	65	12	40	NA	6.5	.70	.40
	Physiol & Cell Biol/Pharm/Neuro & Anatomy	*83*	*49*	*67*		*46*	*40*	*39*
088.	Thomas Jefferson University	10	13	10	.13	5.2	.87	.67
	Physiology	*43*	*49*	*46*	*34*	*61*	*56*	*57*
089.	Tufts University	4	4	2	NA	NA	NA	NA
	*Physiology**	*39*	*41*	*40*				
090.	Tulane University	10	3	4	NA	NA	NA	NA
	Physiology	*43*	*40*	*42*				
091.	Vanderbilt University	18	11	2	NA	NA	NA	NA
	Physiology	*49*	*48*	*40*				
092.	Vermont, University of	8	13	5	.50	5.5	.83	.58
	Physiology and Biophysics	*42*	*49*	*42*	*49*	*57*	*53*	*51*
093.	Virginia Commonwealth University/Medical Col	22	11	24	.42	5.8	.83	.50
	Physiology	*52*	*48*	*56*	*45*	*55*	*53*	*45*
094.	Virginia, University of	17	17	19	.93	5.8	.87	.73
	Physiology	*48*	*53*	*52*	*66*	*54*	*56*	*61*
095.	Washington State University-Pullman	8	8	7	NA	NA	NA	NA
	Zoophysiology	*42*	*45*	*44*				
096.	Washington University-Saint Louis	44	9	33	NA	NA	NA	NA
	*Biology and Biomedical Sciences**	*68*	*46*	*62*				
097.	Washington, University of-Seattle	34	25	8	.96	7.5	.85	.62
	Physiology and Biophysics	*61*	*61*	*44*	*67*	*34*	*54*	*53*
098.	Wayne State University	19	17	12	.47	6.5	.60	.40
	Physiology	*50*	*53*	*47*	*47*	*46*	*30*	*39*
099.	West Virginia University	18	10	12	NA	NA	NA	NA
	Physiology	*49*	*47*	*47*				
100.	Wisconsin, University of-Madison	14	17	20	.63	6.0	1.00	.69
	Physiology	*46*	*53*	*53*	*54*	*52*	*69*	*58*

* indicates program was initiated since 1970.

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TABLE 7.1 Program Measures (Raw and Standardized Values) in Physiology

Prog No.	Survey Results				University Library	Research Support		Published Articles		Survey Ratings Standard Error			
	(08)	(09)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(08)	(09)	(10)	(11)
081.	3.7	2.3	1.0	1.0	0.3	.48	6799	25		.13	.10	.11	.10
	60	*61*	*43*	*62*	*50*	*48*	*47*	*54*	*50*				
082.	2.8	1.7	0.7	0.5	NA	.41	3077	12		.15	.13	.11	.08
	48	*45*	*31*	*48*		*45*	*41*	*47*	*48*				
083.	3.1	1.8	1.3	0.5	0.4	.64	2405	19		.14	.08	.14	.07
	52	*50*	*56*	*48*	*51*	*55*	*40*	*51*	*47*				
084.	3.3	2.1	0.8	0.8	2.0	NA	12514	24		.18	.10	.11	.09
	54	*56*	*34*	*57*	*67*		*56*	*54*	*56*				
085.	2.1	1.3	NA	0.3	-0.4	NA	6914	15		.17	.11	NA	.07
	38	*34*		*42*	*43*		*47*	*49*	*48*				
086.	2.8	1.6	1.1	0.6	NA	.48	2127	9		.15	.11	.07	.08
	47	*42*	*48*	*50*		*48*	*39*	*45*	*47*				
087.	3.5	2.0	1.6	0.6	NA	.57	4151	NA		.15	.12	.15	.08
	57	*55*	*67*	*50*		*52*	*43*		*NA*				
088.	NA	NA	NA	0.3	NA	.60	1851	9		NA	NA	NA	.08
				41		*53*	*39*	*45*	*46*				
089.	1.4	0.8	0.5	0.2	NA	NA	3518	5		.28	.17	.13	.05
	28	*23*	*21*	*38*			*42*	*43*	*44*				
090.	2.5	1.4	1.1	0.3	-1.0	.40	3690	13		.21	.16	.18	.06
	43	*39*	*46*	*41*	*38*	*45*	*42*	*48*	*45*				
091.	3.5	2.0	1.0	0.5	-0.7	.78	5204	13		.21	.13	.14	.09
	56	*54*	*43*	*48*	*41*	*61*	*44*	*48*	*47*				
092.	2.9	1.9	1.2	0.5	NA	NA	4628	11		.15	.09	.08	.08
	49	*50*	*51*	*48*			*43*	*47*	*49*				
093.	3.1	1.8	1.4	0.8	NA	.68	6556	21		.16	.10	.12	.08
	51	*49*	*61*	*57*		*57*	*47*	*52*	*51*				
094.	3.8	[illegible]	1.2	0.9	0.7	.65	6224	17		.12	.07	.09	.08
	60	[illegible]	*51*	*60*	*55*	*55*	*46*	*50*	*49*				
095.	2.3	1.7	1.0	0.4	-0.3	NA	998	5		.21	.18	.00	.07
	40	*46*	*43*	*44*	*45*		*38*	*43*	*43*				
096.	4.0	2.3	1.4	0.9	-0.4	.86	16825	48		.12	.08	.09	.08
	63	*63*	*59*	*61*	*44*	*64*	*63*	*67*	*75*				
097.	4.3	2.6	1.3	1.3	1.5	.68	14164	54		.09	.07	.11	.08
	68	*69*	*54*	*74*	*62*	*57*	*59*	*70*	*68*				
098.	2.6	1.5	1.0	0.4	-0.4	.53	6372	19		.19	.15	.18	.06
	44	*41*	*43*	*43*	*44*	*50*	*46*	*51*	*51*				
099.	2.5	NA	NA	0.3	NA	.33	NA	2		.14	NA	NA	.06
	43			*41*		*42*		*42*	*42*				
100.	3.0	2.0	1.2	0.5	1.6	.64	19738	24		.16	.04	.17	.08
	50	*53*	*52*	*47*	*63*	*55*	*68*	*54*	*52*				

NOTE: On the first line of data for every program, raw values for each measure are reported; on the second line values are reported in standardized form, with mean = 50 and standard deviation = 10. "NA" indicates that the value for a measure is not available. Since the scale used to compute measure 16 is entirely arbitrary, only values in standardized form are reported for this measure.

TABLE 7.1 Program Measures (Raw and Standardized Values) in Physiology

Prog No.	University - Department/Academic Unit	Program Size (01)	(02)	(03)	Characteristics of Program Graduates (04)	(05)	(06)	(07)
101.	Yale University	33	17	20	.82	5.9	.88	.50
	Physiology/ Biology/ Neuroanatomy	*60*	*53*	*53*	*62*	*53*	*57*	*45*

* indicates program was initiated since 1970.

NOTE: On the first line of data for every program, raw values for each measure are reported; on the second line values are reported in standardized form, with mean = 50 and standard deviation = 10. "NA" indicates that the value for a measure is not available.

TABLE 7.1 Program Measures (Raw and Standardized Values) in Physiology

Prog	Survey Results				University Library	Research Support		Published Articles		Survey Ratings Standard Error			
No.	(08)	(09)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(08)	(09)	(10)	(11)
101.	4.3	2.5	1.4	1.3	2.1	.73	4337	64		.10	.07	.10	.08
	68	*67*	*59*	*74*	*68*	*59*	*43*	*76*	*82*				

NOTE: On the first line of data for every program, raw values for each measure are reported; on the second line values are reported in standardized form, with mean = 50 and standard deviation = 10. "NA" indicates that the value for a measure is not available. Since the scale used to compute measure 16 is entirely arbitrary, only values in standardized form are reported for this measure.

TABLE 7.2 Summary Statistics Describing Each Program Measure--Physiology

Measure	Number of Programs Evaluated	Mean	Standard Deviation	DECILES 1	2	3	4	5	6	7	8	9
Program Size												
01 Raw Value	101	19	14	8	9	12	13	15	17	21	26	37
Std Value	101	50	10	42	42	45	45	47	48	51	55	63
02 Raw Value	101	14	11	4	7	8	9	11	12	14	18	25
Std Value	101	50	10	41	44	45	46	48	49	50	54	61
03 Raw Value	101	16	14	4	7	8	9	11	14	16	22	33
Std Value	101	50	10	42	44	44	45	47	49	50	54	62
Program Graduates												
04 Raw Value	48	.53	.25	.13	.28	.42	.46	.56	.59	.67	.78	.85
Std Value	48	50	10	34	40	46	47	51	52	56	60	63
05 Raw Value	48	6.2	.9	7.2	6.7	6.5	6.5	6.1	6.0	5.7	5.5	5.2
Std Value	48	50	10	38	44	46	46	51	52	55	57	61
06 Raw Value	48	.80	.10	.64	.73	.77	.79	.83	.84	.87	.88	.92
Std Value	48	50	10	34	43	47	49	53	54	57	58	62
07 Raw Value	48	.57	.15	.33	.41	.50	.55	.58	.61	.67	.71	.75
Std Value	48	50	10	34	39	45	49	51	53	57	59	62
Survey Results												
08 Raw Value	94	3.0	.7	2.0	2.5	2.6	2.8	3.0	3.3	3.4	3.6	4.0
Std Value	94	50	10	36	43	44	47	50	54	55	58	63
09 Raw Value	87	1.9	.4	1.3	1.5	1.6	1.8	1.9	2.0	2.1	2.2	2.3
Std Value	87	50	10	35	41	43	49	51	54	57	59	62
10 Raw Value	75	1.2	.2	.8	1.0	1.1	1.1	1.2	1.2	1.3	1.4	1.4
Std Value	75	50	10	35	43	48	48	52	52	56	60	60
11 Raw Value	101	.6	.3	.2	.3	.4	.4	.5	.6	.7	.8	1.0
Std Value	101	50	10	37	41	44	44	47	50	54	57	63
University Library												
12 Raw Value	71	.3	1.0	-1.0	-.6	-.4	-.2	.2	.4	.8	1.0	1.7
Std Value	71	50	10	38	42	44	46	50	51	55	57	64
Research Support												
13 Raw Value	80	.52	.24	.06	.35	.42	.48	.57	.62	.68	.73	.78
Std Value	80	50	10	31	43	46	48	52	54	57	59	61
14 Raw Value	88	8687	6173	2798	3363	4492	5444	6799	8330	10349	13696	16140
Std Value	88	50	10	40	41	43	45	47	49	53	58	62
Publication Records												
15 Raw Value	97	17	18	2	4	6	9	11	15	19	28	39
Std Value	97	50	10	42	43	44	45	47	49	51	56	62
16 Std Value	97	50	10	42	43	43	45	47	48	51	56	61

NOTE: Standardized values reported in the preceding table have been computed from exact values of the mean and standard deviation and not the rounded values reported here. Since the scale used to compute measure 16 is entirely arbitrary, only data in standardized form are reported for this measure.

TABLE 7.3 Intercorrelations Among Program Measures on 101 Programs in Physiology

	Measure															
	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16
Program Size																
01		.43	.49	.12	-.15	-.01	.08	.64	.62	.53	.63	.36	.18	.36	.52	.52
02			.54	-.09	.19	.14	.15	.46	.51	.19	.32	.25	.04	.30	.16	.17
03				.01	-.11	-.09	-.08	.42	.43	.29	.34	.41	.16	.37	.12	.14
Program Graduates																
04					.01	.15	.28	.47	.38	-.25	.60	.43	.60	.31	.51	.50
05						.19	.22	-.11	-.16	.00	-.17	-.13	-.17	-.16	-.15	-.12
06							.68	.27	.37	-.03	.22	.01	.17	.14	.30	.29
07								.30	.33	-.01	.32	.10	.32	.23	.32	.33
Survey Results																
08									.95	.38	.89	.49	.57	.51	.69	.71
09										.40	.84	.53	.47	.51	.63	.65
10											.29	.18	.06	-.01	.23	.20
11												.58	.57	.46	.80	.81
University Library																
12													.23	.50	.34	.37
Research Support																
13														.28	.48	.51
14															.43	.48
Publication Records																
15																.97
16																

NOTE: Since in computing correlation coefficients program data must be available for both of the measures being correlated, the actual number of programs on which each coefficient is based varies.

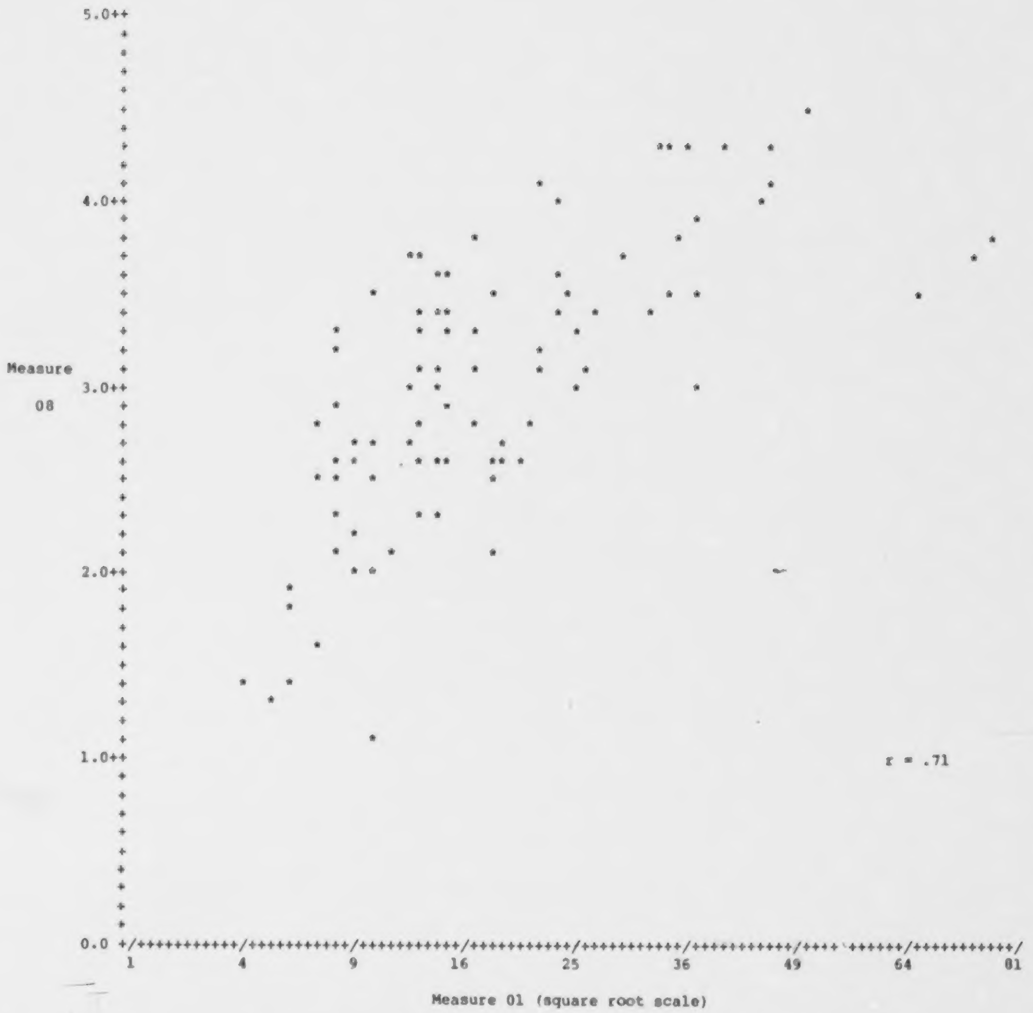

FIGURE 7.1 Mean rating of scholarly quality of faculty (measure 08) versus number of faculty members (measure 01)--94 programs in physiology.

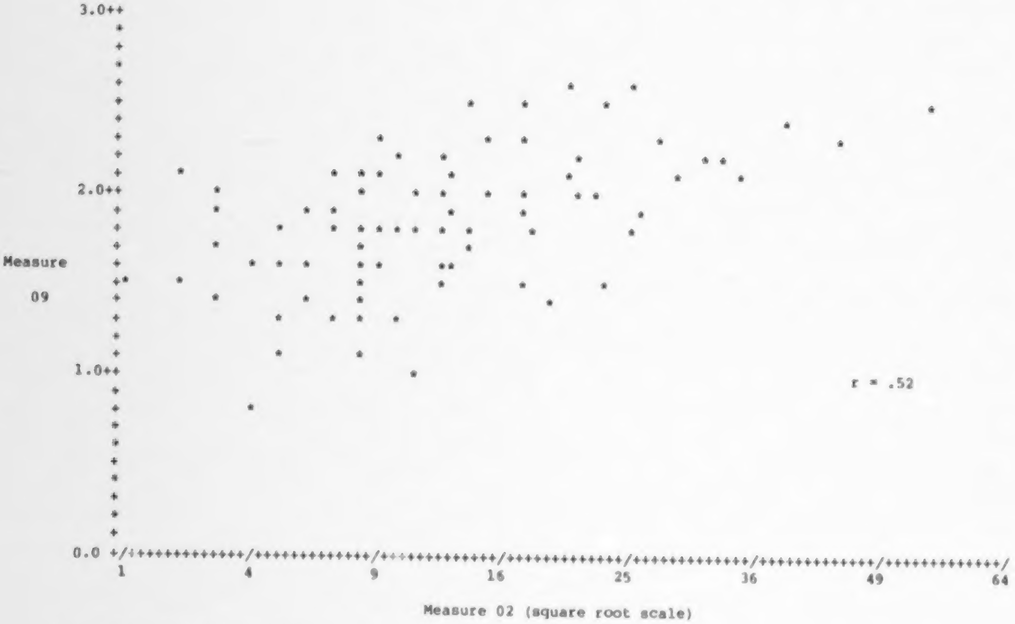

FIGURE 7.2 Mean rating of program effectiveness in educating research scholars/scientists (measure 09) versus number of graduates in last five years (measure 02)--87 programs in physiology.

TABLE 7.4 Characteristics of Survey Participants in Physiology

	Respondents	
	N	%
Field of Specialization		
Biophysics	11	8
Physiology, Animal/Human	113	77
Other/Unknown	22	15
Faculty Rank		
Professor	73	50
Associate Professor	45	31
Assistant Professor	28	19
Year of Highest Degree		
Pre-1950	8	6
1950-59	38	26
1960-69	57	39
Post-1969	42	29
Unknown	1	1
Evaluator Selection		
Nominated by Institution	120	82
Other	26	18
Survey Form		
With Faculty Names	136	93
Without Names	10	7
Total Evaluators	146	100

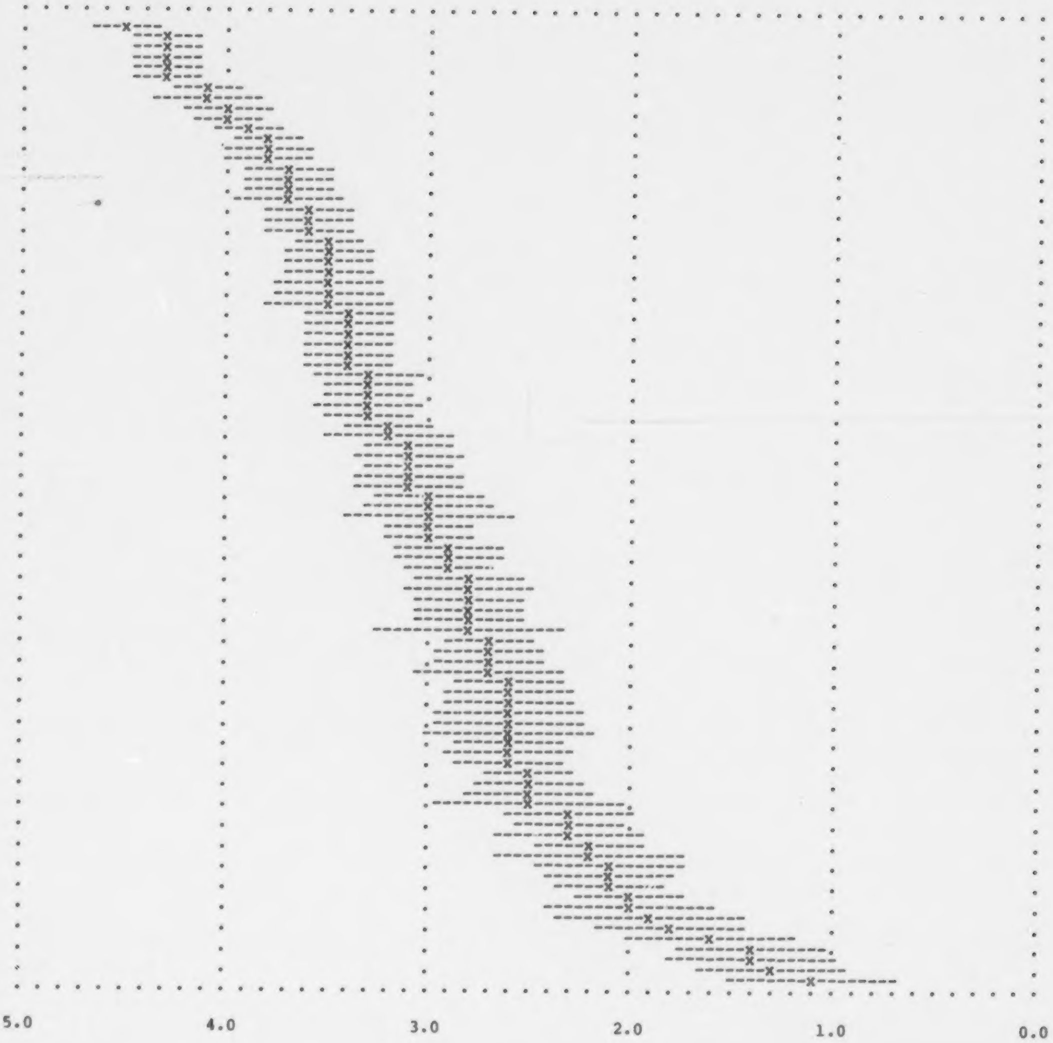

FIGURE 7.3 Mean rating of scholarly quality of faculty in 94 programs in physiology.

NOTE: Programs are listed in sequence of mean rating, with the highest-rated program appearing at the top of the page. The broken lines (---) indicate a confidence interval of ±1.5 standard errors around the reported mean (x) of each program.

VIII
Zoology Programs

In this chapter 70 research-doctorate programs in zoology are assessed. These programs, according to the information supplied by their universities, have accounted for 1,753 doctoral degrees awarded during the FY1976-80 period.[1] On the average, 33 full-time and part-time students intending to earn doctorates were enrolled in a program in December 1980, with an average faculty size of 21 members.[2] Most of the 70 programs, listed in Table 8.1, are located in departments of zoology. Approximately one-third are found in departments of biology or biological sciences. Four programs were initiated since 1970, and only one institution--Utah State University--had two zoology programs included in the assessment. In addition to the 69 institutions represented in this discipline, another 8 were initially identified as meeting the criteria[3] for inclusion in the assessment:

CUNY--Graduate School
University of California--Santa Barbara
Florida State University--Tallahassee
Illinois Institute of Technology
University of Illinois--Urbana-Champaign
University of Kansas
University of Michigan--Ann Arbor
Tulane University

Zoology programs at these eight institutions have not been included in the evaluations in this discipline, since in each case the study coordinator either indicated that the institution did not at that time have a research-doctorate program in zoology or failed to provide the information requested by the committee.

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[1] Data from the NRC's Survey of Earned Doctorates indicate that 1,219 research doctorates in zoology were awarded by U.S. universities between FY1976 and FY1980. Since the NRC figure is based on field of degree and not department, it may exclude some doctorates included in the numbers reported by the institutional coordinators.

[2] See the reported means for measures 03 and 01 in Table 8.2.

[3] As mentioned in Chapter I, the primary criterion for inclusion was that a university had awarded 8 or more doctorates in zoology during the FY1976-78 period.

Before examining individual program results presented in Table 8.1, the reader is urged to refer to Chapter II, in which each of the 16 measures used in the assessment is discussed. Summary statistics describing every measure are given in Table 8.2. For 10 of the measures, data are reported for at least 66 of the 70 zoology programs. For measures 04-07, which pertain to characteristics of the program graduates, data are presented for approximately four-fifths of the programs; the other fifth had too few graduates on which to base statistics.[4] For measure 12, a composite index of the size of a university library, data are available for 49 programs; for measure 14, the total university expenditures for research in the biological sciences, data are available for 44 programs. The programs not evaluated on measures 12 and 14 are typically smaller--in terms of faculty size and graduate student enrollment--than other zoology programs. Were data on these two measures available for all 70 programs, it is likely that their reported means would be appreciably lower (and that some of the correlations of these measures with others would be higher).

Intercorrelations among the 16 measures (Pearson product-moment coefficients) are given in Table 8.3. Of particular note are the high positive correlations of reputational survey ratings (08, 09) with measures of research support (13, 14), publication records (15, 16), and number of program faculty members (02). Figure 8.1 illustrates the relation between the mean rating of the scholarly quality of faculty (measure 08) and the number of faculty members (measure 01) for each of 69 programs in zoology. Figure 8.2 plots the mean rating of program effectiveness (measure 09) against the total number of FY1976-80 program graduates (measure 02). Although in both figures there is a significant positive correlation between program size and reputational rating, it is quite apparent that some of the smaller programs received high mean ratings and that some of the larger programs received low mean ratings.

Table 8.4 describes the 123 faculty members who participated in the evaluation of zoology programs. These individuals constituted 59 percent of those asked to respond to the survey in this discipline and 8 percent of the faculty population in the 70 research-doctorate programs being evaluated.[5] A majority of the survey participants had earned their highest degree prior to 1970, and almost half held the rank of full professor.

To assist the reader in interpreting results of the survey evaluations, estimated standard errors have been computed for mean ratings of the scholarly quality of faculty in 69 zoology programs (and are given in Table 8.1). For each program the mean rating and an associated "confidence interval" of 1.5 standard errors are illustrated in Figure 8.3 (listed in order of highest to lowest mean rating). In comparing two programs, if their confidence intervals do not overlap, one may conclude that there is a significant difference in their mean ratings at a .05 level of significance.[6] From this figure it is also apparent that one should have somewhat more confidence in the accuracy of the mean ratings of higher-rated programs than lower-rated programs. This generalization results primarily from the fact that evaluators are not as likely to be familiar with the less prestigious programs, and consequently the mean ratings of these programs are usually based on fewer survey responses.

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[4] As mentioned in Chapter II, data for measures 04-07 are not reported if they are based on the survey responses of fewer than 10 FY1975-79 program graduates.

[5] See Table 2.3 in Chapter II.

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[6] See pp. 31-33 for a discussion of the interpretation of mean ratings and associated confidence intervals.

TABLE 8.1 Program Measures (Raw and Standardized Values) in Zoology

Prog No.	University - Department/Academic Unit	Program Size (01)	(02)	(03)	Characteristics of Program Graduates (04)	(05)	(06)	(07)
001.	Arizona State University-Tempe	24	28	43	.29	7.7	.54	.32
	Zoology	*53*	*51*	*54*	*48*	*44*	*42*	*51*
002.	Arizona, University of-Tucson	19	21	NA	.24	7.3	.45	.20
	General Biology	*48*	*47*		*46*	*48*	*35*	*43*
003.	Auburn University	33	30	51	.17	6.9	.77	.24
	Zoology/Entomology	*61*	*52*	*57*	*42*	*52*	*59*	*46*
004.	Boston University	10	13	18	.83	7.2	.50	.25
	Biology	*39*	*43*	*44*	*75*	*49*	*39*	*47*
005.	California, University of-Irvine	15	15	18	.67	5.5	.92	.62
	Ecol & Evolut Biol/Devel & Cell Biology	*44*	*44*	*44*	*67*	*66*	*71*	*70*
006.	California, University of-Berkeley	29	105	78	.51	6.2	.72	.50
	Zoology	*58*	*92*	*68*	*59*	*59*	*55*	*63*
007.	California, University of-Davis	20	30	31	.19	6.8	.61	.39
	Zoology	*49*	*52*	*49*	*43*	*54*	*47*	*56*
008.	California, University of-Los Angeles	42	77	115	.38	6.7	.63	.40
	Biology	*70*	*77*	*83*	*53*	*54*	*49*	*56*
009.	Chicago, University of	11	14	15	NA	NA	NA	NA
	Biology	*40*	*44*	*43*				
010.	Clemson University	14	7	23	NA	NA	NA	NA
	Zoology	*43*	*40*	*46*				
011.	Colorado State University-Fort Collins	33	22	38	.11	8.0	.47	.16
	Zoology and Entomology	*61*	*48*	*52*	*39*	*41*	*37*	*41*
012.	Colorado, University of	16	43	27	.16	7.3	.50	.38
	Environmental, Population, & Organismic Bio	*45*	*59*	*48*	*42*	*48*	*39*	*55*
013.	Connecticut, University of-Storrs	16	15	25	.36	7.8	.50	.14
	Biological Sciences	*45*	*44*	*47*	*52*	*43*	*39*	*40*
014.	Cornell University-Ithaca	10	6	5	NA	NA	NA	NA
	Zoology	*39*	*39*	*39*				
015.	Duke University	24	47	63	.43	6.0	.71	.36
	Zoology	*53*	*61*	*62*	*55*	*61*	*55*	*54*
016.	Florida, University of-Gainesville	33	20	78	.18	6.0	.44	.31
	Zoology	*61*	*47*	*68*	*43*	*61*	*34*	*51*
017.	Georgia, University of-Athens	27	34	50	.29	7.7	.84	.61
	Zoology	*56*	*54*	*57*	*48*	*44*	*65*	*70*
018.	Harvard University	46	54	76	.50	6.1	.60	.40
	Biology (Organismic & Evolutionary)	*74*	*65*	*67*	*59*	*60*	*46*	*56*
019.	Hawaii, University of	24	21	39	.39	8.0	.72	.39
	Zoology	*53*	*47*	*52*	*53*	*41*	*56*	*56*
020.	Howard University	14	25	45	.31	10.1	.47	.07
	*Zoology**	*43*	*50*	*55*	*49*	*20*	*36*	*35*

* indicates program was initiated since 1970.

NOTE: On the first line of data for every program, raw values for each measure are reported; on the second line values are reported in standardized form, with mean = 50 and standard deviation = 10. "NA" indicates that the value for a measure is not available.

TABLE 8.1 Program Measures (Raw and Standardized Values) in Zoology

Prog No.	Survey Results				University Library	Research Support		Published Articles		Survey Ratings Standard Error			
	(08)	(09)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(08)	(09)	(10)	(11)
001.	3.0	1.7	1.6	0.9	-0.3	.46	NA	17		.11	.08	.08	.08
	53	*51*	*73*	*55*	*44*	*55*		*50*	*59*				
002.	3.1	2.0	1.3	0.9	0.9	.26	7828	26		.09	.05	.11	.07
	55	*57*	*58*	*57*	*56*	*45*	*48*	*57*	*55*				
003.	1.9	1.4	1.1	0.2	NA	.00	NA	6		.16	.14	.14	.04
	39	*44*	*45*	*35*		*32*		*42*	*40*				
004.	2.6	1.5	0.9	0.7	-0.4	.50	NA	5		.14	.10	.11	.06
	48	*47*	*35*	*49*	*44*	*57*		*41*	*41*				
005.	3.3	2.0	1.3	1.0	NA	.60	6547	12		.13	.08	.10	.08
	57	*57*	*56*	*58*		*62*	*47*	*47*	*55*				
006.	4.4	2.5	1.0	1.4	2.2	.69	18977	73		.08	.06	.06	.07
	70	*69*	*42*	*71*	*69*	*67*	*66*	*93*	*87*				
007.	3.4	2.0	1.2	1.1	0.6	.50	18053	54		.09	.05	.09	.07
	58	*58*	*54*	*62*	*53*	*57*	*64*	*79*	*84*				
008.	4.1	2.4	1.2	1.3	2.0	.64	15581	30		.08	.07	.08	.07
	67	*67*	*51*	*69*	*66*	*64*	*60*	*60*	*68*				
009.	3.7	2.2	0.9	1.0	0.9	.55	17589	9		.13	.08	.09	.08
	62	*62*	*35*	*59*	*56*	*59*	*64*	*44*	*45*				
010.	1.9	1.2	1.4	0.5	NA	.21	1275	6		.16	.11	.12	.07
	40	*39*	*60*	*45*		*43*	*38*	*42*	*40*				
011.	2.8	1.8	1.5	0.8	-1.1	.27	8863	21		.14	.06	.11	.08
	50	*52*	*66*	*53*	*37*	*46*	*50*	*53*	*59*				
012.	3.0	1.9	1.5	0.9	-0.9	.75	11967	20		.13	.07	.09	.08
	54	*55*	*68*	*55*	*39*	*70*	*55*	*53*	*58*				
013.	2.8	1.6	1.2	0.7	-0.5	.38	15199	9		.12	.09	.11	.07
	50	*48*	*51*	*49*	*43*	*51*	*60*	*44*	*46*				
014.	3.6	2.1	1.0	0.9	1.6	.00	14597	39		.14	.09	.11	.08
	61	*59*	*42*	*56*	*63*	*32*	*59*	*67*	*65*				
015.	4.1	2.4	1.3	1.3	0.3	.67	11320	29		.09	.06	.08	.07
	67	*67*	*56*	*67*	*51*	*65*	*54*	*60*	*55*				
016.	3.2	1.8	1.4	1.0	0.8	.46	3486	27		.10	.07	.08	.07
	56	*53*	*64*	*60*	*55*	*55*	*42*	*58*	*51*				
017.	3.5	2.0	1.3	1.1	0.4	.44	10714	24		.10	.06	.09	.07
	59	*58*	*56*	*63*	*52*	*54*	*53*	*56*	*56*				
018.	4.7	2.7	1.1	1.5	3.0	.74	34979	18		.06	.05	.07	.07
	74	*72*	*44*	*73*	*76*	*69*	*90*	*51*	*51*				
019.	2.6	1.6	1.1	0.6	-0.1	.29	4440	10		.12	.09	.12	.08
	48	*49*	*47*	*47*	*46*	*47*	*43*	*45*	*52*				
020.	1.6	1.0	NA	0.2	-0.4	.14	NA	0		.16	.17	NA	.04
	36	*35*		*35*	*44*	*40*		*37*	*38*				

NOTE: On the first line of data for every program, raw values for each measure are reported; on the second line values are reported in standardized form, with mean = 50 and standard deviation = 10. "NA" indicates that the value for a measure is not available. Since the scale used to compute measure 16 is entirely arbitrary, only values in standardized form are reported for this measure.

TABLE 8.1 Program Measures (Raw and Standardized Values) in Zoology

Prog No.	University - Department/Academic Unit	Program Size			Characteristics of Program Graduates			
		(01)	(02)	(03)	(04)	(05)	(06)	(07)
021.	Idaho State University-Pocatello	12	10	12	.08	7.8	.58	.00
	Biology	*41*	*42*	*42*	*38*	*43*	*45*	*30*
022.	Indiana University-Bloomington	12	48	35	.35	7.0	.74	.54
	Biology	*41*	*62*	*51*	*51*	*51*	*57*	*66*
023.	Iowa State University-Ames	20	25	19	.15	6.3	.73	.39
	Zoology	*49*	*50*	*45*	*41*	*58*	*56*	*55*
024.	Iowa, University of-Iowa City	24	15	50	.83	6.3	.46	.27
	Zoology	*53*	*44*	*57*	*75*	*58*	*35*	*48*
025.	Kentucky, University of	21	7	11	NA	NA	NA	NA
	Biological Sciences	*50*	*40*	*41*				
026.	Louisiana State University-Baton Rouge	12	22	17	.13	6.9	.59	.27
	Zoology and Physiology	*41*	*48*	*44*	*40*	*52*	*46*	*48*
027.	Louisville, University of	17	15	36	.18	7.0	.46	.09
	Biology	*46*	*44*	*51*	*43*	*51*	*35*	*36*
028.	Maine, University of-Orono	20	17	16	.47	6.6	.36	.14
	Zoology	*49*	*45*	*43*	*57*	*55*	*28*	*40*
029.	Maryland, University of-College Park	35	43	41	.24	6.7	.62	.19
	Zoology	*63*	*59*	*53*	*46*	*54*	*48*	*43*
030.	Massachusetts, University of-Amherst	18	39	32	.28	7.4	.97	.66
	Zoology	*47*	*57*	*50*	*48*	*47*	*75*	*73*
031.	Miami University-Ohio	24	13	12	NA	NA	NA	NA
	*Zoology**	*53*	*43*	*42*				
032.	Michigan State University-East Lansing	28	43	58	.38	6.2	.55	.27
	Zoology	*57*	*59*	*60*	*52*	*59*	*43*	*48*
033.	Minnesota, University of	14	23	15	.32	8.2	.63	.08
	Ecol & Behavioral Biol/Genetics & Cell Biol	*43*	*49*	*43*	*50*	*39*	*48*	*36*
034.	Mississippi State University-Starkville	15	12	8	.23	6.9	.54	.23
	Biological Sciences	*44*	*43*	*40*	*45*	*52*	*42*	*45*
035.	Nebraska, University of-Lincoln	15	20	21	.18	7.3	.68	[illegible]
	Life Sciences	*44*	*47*	*45*	*43*	*49*	*53*	*49*
036.	New Hampshire, University of	17	29	13	.12	7.2	.62	.12
	Zoology	*46*	*52*	*42*	*40*	*49*	*48*	*38*
037.	North Carolina State University-Raleigh	15	27	29	.30	8.3	.70	.15
	Zoology	*44*	*51*	*49*	*49*	*38*	*54*	*40*
038.	North Carolina, University of-Chapel Hill	23	29	38	.31	6.3	.85	.46
	Zoology	*52*	*52*	*52*	*49*	*59*	*65*	*60*
039.	North Dakota, University of-Grand Forks	12	5	10	NA	NA	NA	NA
	Biology	*41*	*39*	*41*				
040.	Notre Dame, University of	17	18	21	.42	7.2	.78	.39
	Biology	*46*	*46*	*45*	*55*	*49*	*60*	*56*

* indicates program was initiated since 1970.

NOTE: On the first line of data for every program, raw values for each measure are reported; on the second line values are reported in standardized form, with mean = 50 and standard deviation = 10. "NA" indicates that the value for a measure is not available.

TABLE 8.1 Program Measures (Raw and Standardized Values) in Zoology

Prog	Survey Results				University Library	Research Support		Published Articles		Survey Ratings Standard Error			
No.	(08)	(09)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(08)	(09)	(10)	(11)
021.	1.7	1.0	1.2	0.4	NA	.17	NA	5		.16	.12	.13	.06
	37	35	49	41		41		41	39				
022.	3.2	2.0	0.7	0.8	0.9	.50	NA	10		.11	.07	.10	.07
	56	57	26	53	56	57		45	46				
023.	2.7	1.8	1.4	0.6	-0.5	.35	5287	14		.12	.08	.11	.07
	50	53	61	48	43	50	45	48	50				
024.	3.3	1.9	1.4	0.9	0.3	.71	7088	4		.09	.07	.08	.07
	57	55	63	57	50	67	47	40	44				
025.	2.2	1.3	1.1	0.4	-0.1	.48	484	9		.17	.11	.15	.06
	44	41	45	40	47	56	37	44	43				
026.	1.6	1.2	1.1	0.4	-0.3	.25	5116	24		.16	.14	.14	.06
	36	39	47	41	44	45	44	56	53				
027.	1.6	1.0	0.8	0.2	NA	.12	NA	0		.18	.15	.13	.05
	36	35	33	37		38		37	38				
028.	2.3	1.4	1.4	0.5	NA	.40	NA	14		.13	.13	.12	.07
	45	43	60	44		52		48	48				
029.	3.2	1.9	1.3	1.0	0.2	.26	1623	22		.09	.07	.10	.07
	56	54	56	58	49	45	39	54	55				
030.	2.8	1.8	1.0	0.8	-0.7	.44	3022	20		.11	.08	.11	.07
	51	52	43	53	41	54	41	53	55				
031.	2.2	1.4	1.0	0.5	-0.8	.33	NA	10		.13	.11	.08	.06
	43	44	44	45	40	49		45	42				
032.	3.0	1.9	1.2	0.8	0.3	.43	10357	30		.13	.08	.11	.08
	53	54	50	52	51	54	52	60	57				
033.	2.9	1.9	1.0	0.7	1.2	.29	13696	28		.14	.09	.13	.08
	51	55	42	49	59	47	58	59	57				
034.	1.6	0.9	0.9	0.2	NA	.13	2839	16		.18	.16	.11	.05
	35	32	39	37		39	41	50	46				
035.	2.4	1.4	1.2	0.5	-0.5	.40	2965	6		.14	.11	.10	.07
	45	44	50	45	43	52	41	42	40				
036.	2.2	1.5	1.3	0.4	NA	.24	NA	6		.13	.12	.09	.07
	43	45	58	42		44		42	43				
037.	2.5	1.6	1.2	0.5	NA	.20	6741	16		.14	.11	.10	.07
	47	48	49	44		42	47	50	47				
038.	3.4	2.0	1.3	1.0	1.0	.57	9849	15		.09	.05	.10	.07
	58	57	58	59	57	60	52	49	44				
039.	1.4	0.9	1.1	0.3	NA	.17	NA	5		.18	.14	.09	.06
	33	32	48	38		41		41	40				
040.	2.7	1.7	1.0	0.6	-1.3	.47	NA	7		.14	.09	.09	.07
	49	50	42	48	34	56		43	48				

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TABLE 8.1 Program Measures (Raw and Standardized Values) in Zoology

Prog No.	University - Department/Academic Unit	Program Size			Characteristics of Program Graduates			
		(01)	(02)	(03)	(04)	(05)	(06)	(07)
041.	Ohio State University-Columbus	41	42	63	.16	6.0	.65	.16
	Zoology	*69*	*59*	*62*	*42*	*61*	*50*	*41*
042.	Ohio University-Athens	19	10	30	NA	NA	NA	NA
	Zoology/Microbiology	*48*	*42*	*49*				
043.	Oklahoma State University-Stillwater	15	6	17	NA	NA	NA	NA
	Zoology	*44*	*39*	*44*				
044.	Oklahoma, University of-Norman	25	22	7	.23	8.0	.64	.18
	Zoology	*54*	*48*	*40*	*45*	*41*	*49*	*42*
045.	Oregon State University-Corvallis	16	24	13	.22	8.9	.48	.17
	Zoology	*45*	*49*	*42*	*45*	*32*	*37*	*42*
046.	Oregon, University of-Eugene	17	3	5	NA	NA	NA	NA
	Biology	*46*	*38*	*39*				
047.	Pennsylvania State University	16	4	6	NA	NA	NA	NA
	Zoology	*45*	*38*	*39*				
048.	Rhode Island, University of	20	15	32	.40	7.5	.70	.20
	Zoology	*49*	*44*	*50*	*54*	*46*	*54*	*43*
049.	Rutgers, The State University-New Brunswick	34	36	90	.35	7.4	.56	.33
	Zoology	*62*	*55*	*73*	*51*	*47*	*44*	*52*
050.	Rutgers, The State University-Newark	19	27	46	.12	6.4	.68	.24
	*Zoology and Physiology**	*48*	*51*	*55*	*40*	*58*	*53*	*46*
051.	SUNY-College of Environ Science & Forestry	19	25	22	.29	6.9	.67	.25
	Environmental and Forest Biology	*48*	*50*	*46*	*48*	*52*	*52*	*47*
052.	South Florida, University of-Tampa	11	16	21	.23	7.8	.77	.39
	Biology	*40*	*45*	*45*	*45*	*44*	*59*	*55*
053.	Southern Illinois University-Carbondale	24	16	19	.19	9.7	.63	.19
	Zoology	*53*	*45*	*45*	*43*	*24*	*48*	*43*
054.	Stanford University	9	16	15	.90	6.5	.70	.60
	Biological Sciences	*38*	*45*	*43*	*79*	*56*	*54*	*69*
055.	Syracuse University	5	8	11	NA	NA	NA	NA
	*Biology**	*34*	*40*	*41*				
056.	Tennessee, University of-Knoxville	30	27	28	.35	6.7	.73	.46
	Zoology	*58*	*51*	*48*	*51*	*54*	*56*	*60*
057.	Texas A & M University	12	10	26	.00	6.3	.73	.18
	Biology	*41*	*42*	*47*	*34*	*58*	*56*	*42*
058.	Texas Tech University-Lubbock	16	14	12	.08	5.9	.85	.31
	Biological Sciences	*45*	*44*	*42*	*38*	*62*	*65*	*50*
059.	Texas, University of-Austin	45	70	80	.74	6.2	.63	.47
	Zoology	*73*	*74*	*69*	*71*	*59*	*49*	*61*
060.	Utah State University-Logan	41	30	51	.33	6.8	.56	.22
	Biology	*69*	*52*	*57*	*50*	*54*	*43*	*45*

* indicates program was initiated since 1970.

NOTE: On the first line of data for every program, raw values for each measure are reported; on the second line values are reported in standardized form, with mean = 50 and standard deviation = 10. "NA" indicates that the value for a measure is not available.

TABLE 8.1 Program Measures (Raw and Standardized Values) in Zoology

Prog No.	Survey Results				University Library	Research Support		Published Articles		Survey Ratings Standard Error			
	(08)	(09)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(08)	(09)	(10)	(11)
041.	3.1	1.9	1.3	1.0	0.9	.27	8330	17		.11	.06	.07	.07
	55	54	58	57	56	46	49	50	51				
042.	1.7	1.1	0.9	0.4	NA	.26	NA	9		.16	.12	.17	.06
	37	37	39	42		45		44	42				
043.	1.9	1.3	1.1	0.4	-1.9	.20	3127	6		.18	.12	.10	.07
	39	40	44	42	29	42	41	42	40				
044.	2.6	1.7	1.2	0.6	-0.6	.32	NA	24		.13	.07	.11	.07
	48	52	53	48	42	48		56	54				
045.	3.0	1.8	1.4	0.9	NA	.63	7108	24		.09	.07	.11	.08
	54	52	61	56		63	47	56	56				
046.	3.1	1.8	1.0	0.9	-0.9	.53	NA	11		.10	.08	.09	.07
	55	54	42	55	38	59		46	47				
047.	2.5	1.5	1.0	0.6	0.7	.38	8024	13		.13	.11	.07	.07
	46	47	42	46	54	51	49	47	52				
048.	2.2	1.4	1.0	0.5	NA	.15	NA	14		.13	.08	.08	.06
	43	44	44	45		40		48	49				
049.	2.7	1.8	1.2	0.6	0.8	.15	7505	30		.11	.08	.11	.07
	50	54	50	46	55	40	48	60	55				
050.	2.2	1.6	NA	0.2	NA	.11	7505	3		.12	.12	NA	.05
	43	47		37		38	48	40	44				
051.	2.7	1.8	1.1	0.2	NA	.21	NA	5		.19	.11	.12	.05
	50	52	48	37		43		41	40				
052.	2.0	1.3	1.2	0.5	NA	.09	NA	8		.16	.12	.13	.07
	41	42	52	44		37		43	42				
053.	2.1	1.3	1.1	0.5	-0.2	.13	NA	3		.15	.15	.14	.07
	42	42	49	43	46	39		40	39				
054.	4.0	2.2	1.0	1.2	2.0	NA	12514	11		.09	.07	.08	.07
	66	63	41	65	67		56	46	46				
055.	2.7	1.6	0.9	0.7	-0.3	NA	NA	8		.17	.10	.07	.08
	50	47	35	50	44			43	44				
056.	2.7	1.7	1.3	0.6	-0.4	.23	NA	15		.12	.10	.10	.07
	49	50	58	49	43	44		49	49				
057.	1.8	1.2	1.0	0.4	-0.5	.17	3199	22		.18	.13	.17	.06
	38	40	39	40	43	41	41	54	49				
058.	2.4	1.4	1.4	0.4	NA	.19	NA	20		.15	.14	.11	.08
	46	44	63	43		42		53	50				
059.	4.0	2.3	1.2	1.2	1.6	.64	5757	19		.09	.06	.07	.07
	65	64	53	65	63	64	45	52	57				
060.	2.6	1.7	1.4	0.4	NA	.10	NA	16		.15	.13	.12	.06
	48	50	60	42		37		50	47				

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TABLE 8.1 Program Measures (Raw and Standardized Values) in Zoology

Prog No.	University - Department/Academic Unit	Program Size (01)	(02)	(03)	Characteristics of Program Graduates (04)	(05)	(06)	(07)
061.	Utah State University-Logan	11	17	24	.15	8.3	.77	.31
	Range Science	*40*	*45*	*47*	*41*	*39*	*59*	*50*
062.	Vanderbilt University	6	4	5	NA	NA	NA	NA
	General Biology	*35*	*38*	*39*				
063.	Virginia Polytechnic Institute & State Univ	26	27	22	.27	7.5	.73	.18
	Biology	*55*	*51*	*46*	*47*	*46*	*56*	*42*
064.	Washington State University-Pullman	23	15	15	.40	6.5	NA	NA
	Zoology	*52*	*44*	*43*	*54*	*56*		
065.	Washington, University of-Seattle	32	36	12	.61	7.1	.75	.47
	Zoology	*60*	*55*	*42*	*64*	*50*	*58*	*61*
066.	Wayne State University	10	NA	NA	.19	9.8	.50	.19
	Zoology	*39*			*43*	*23*	*39*	*43*
067.	Wisconsin, University of-Madison	27	60	70	.36	7.2	.79	.45
	Zoology	*56*	*68*	*65*	*52*	*49*	*61*	*59*
068.	Wisconsin, University of-Milwaukee	14	NA	NA	NA	NA	NA	NA
	Zoology	*43*						
069.	Wyoming, University of	18	21	13	.23	5.0	.62	.15
	Zoology	*47*	*47*	*42*	*45*	*71*	*48*	*40*
070.	Yale University	58	65	107	.80	5.9	.84	.56
	Biology/Human Genetics/Geology-Paleontology	*86*	*71*	*80*	*74*	*62*	*64*	*67*

* indicates program was initiated since 1970.

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TABLE 8.1 Program Measures (Raw and Standardized Values) in Zoology

Prog	Survey Results				University Library	Research Support		Published Articles		Survey Ratings Standard Error			
No.	(08)	(09)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(08)	(09)	(10)	(11)
061.	NA	NA	NA	0.1	NA	.09	NA	16		NA	NA	NA	.04
				34		*37*		*50*	*47*				
062.	1.4	0.9	NA	0.2	-0.7	NA	5204	0		.24	.19	NA	.05
	33	*32*		*37*	*40*		*44*	*37*	*38*				
063.	2.8	1.8	1.5	0.7	-0.0	.31	3108	13		.14	.10	.09	.07
	51	*53*	*65*	*51*	*47*	*48*	*41*	*47*	*44*				
064.	2.8	1.8	1.3	0.7	-0.3	.48	998	14		.12	.10	.10	.07
	51	*52*	*55*	*49*	*45*	*56*	*38*	*48*	*46*				
065.	4.3	2.6	1.5	1.5	1.5	.72	14164	60		.08	.06	.07	.07
	69	*70*	*69*	*73*	*61*	*68*	*58*	*83*	*83*				
066.	1.5	0.9	0.8	0.3	-0.4	.50	6372	8		.18	.16	.18	.06
	35	*32*	*29*	*40*	*44*	*57*	*46*	*43*	*46*				
067.	4.0	2.3	1.0	1.2	1.6	.44	19738	26		.09	.07	.06	.07
	66	*65*	*44*	*65*	*62*	*54*	*67*	*57*	*55*				
068.	2.0	1.1	1.1	0.4	NA	.14	NA	NA		.20	.14	.12	.07
	40	*38*	*44*	*43*		*40*			*NA*				
069.	1.9	1.3	1.4	0.4	NA	.17	NA	8		.13	.11	.12	.06
	40	*42*	*60*	*40*		*41*		*43*	*43*				
070.	4.2	2.5	1.2	1.3	2.1	.78	4337	19		.09	.06	.08	.07
	69	*69*	*49*	*66*	*68*	*71*	*43*	*52*	*56*				

NOTE: On the first line of data for every program, raw values for each measure are reported; on the second line values are reported in standardized form, with mean = 50 and standard deviation = 10. "NA" indicates that the value for a measure is not available. Since the scale used to compute measure 16 is entirely arbitrary, only values in standardized form are reported for this measure.

TABLE 8.2 Summary Statistics Describing Each Program Measure--Zoology

Measure	Number of Programs Evaluated	Mean	Standard Deviation	DECILES 1	2	3	4	5	6	7	8	9
Program Size												
01 Raw Value	70	21	10	11	12	15	16	19	20	24	28	34
Std Value	70	50	10	40	41	44	45	48	49	53	57	62
02 Raw Value	68	26	19	7	13	15	17	21	25	29	36	47
Std Value	68	50	10	40	43	44	45	47	50	52	55	61
03 Raw Value	67	33	25	9	12	15	19	24	30	38	50	72
Std Value	67	50	10	41	42	43	45	47	49	52	57	66
Program Graduates												
04 Raw Value	57	.33	.20	.12	.16	.19	.23	.29	.32	.36	.41	.63
Std Value	57	50	10	40	42	43	45	48	50	52	54	65
05 Raw Value	57	7.1	1.0	8.3	7.8	7.5	7.2	7.0	6.8	6.5	6.3	6.0
Std Value	57	50	10	38	43	46	49	51	53	56	58	61
06 Raw Value	56	.65	.13	.46	.50	.56	.62	.63	.69	.72	.75	.81
Std Value	56	50	10	35	38	43	48	48	53	55	58	62
07 Raw Value	56	.30	.15	.13	.17	.19	.23	.27	.32	.39	.44	.52
Std Value	56	50	10	39	41	43	45	48	51	56	59	65
Survey Results												
08 Raw Value	69	2.7	.8	1.6	1.9	2.2	2.5	2.7	2.8	3.1	3.3	4.0
Std Value	69	50	10	36	40	43	47	50	51	55	57	66
09 Raw Value	69	1.7	.4	1.0	1.3	1.4	1.6	1.7	1.8	1.9	2.0	2.3
Std Value	69	50	10	35	42	44	48	51	53	55	58	64
10 Raw Value	66	1.2	.2	.9	1.0	1.0	1.1	1.2	1.2	1.3	1.4	1.4
Std Value	66	50	10	37	42	42	47	52	52	57	62	62
11 Raw Value	70	.7	.4	.2	.4	.4	.5	.6	.7	.9	1.0	1.2
Std Value	70	50	10	36	42	42	45	47	50	56	59	65
University Library												
12 Raw Value	49	.3	1.0	-.9	-.6	-.4	-.3	-.1	.4	.8	1.0	1.7
Std Value	49	50	10	39	41	43	44	46	51	55	57	64
Research Support												
13 Raw Value	67	.36	.20	.11	.16	.20	.26	.31	.41	.47	.52	.65
Std Value	67	50	10	38	40	42	45	48	53	56	58	65
14 Raw Value	44	8806	6503	2109	3123	4575	6126	7108	8146	10643	13790	16786
Std Value	44	50	10	40	41	44	46	47	49	53	58	62
Publication Records												
15 Raw Value	69	16	13	5	6	9	11	14	16	20	24	29
Std Value	69	50	10	41	42	44	46	48	50	53	56	60
16 Std Value	69	50	10	40	42	44	46	48	50	54	56	58

NOTE: Standardized values reported in the preceding table have been computed from exact values of the mean and standard deviation and not the rounded values reported here. Since the scale used to compute measure 16 is entirely arbitrary, only data in standardized form are reported for this measure.

TABLE 8.3 Intercorrelations Among Program Measures on 70 Programs in Zoology

	Measure															
	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16
Program Size																
01		.66	.78	.26	.34	.05	.23	.53	.56	.35	.50	.48	.34	.20	.32	.36
02			.78	.27	.25	.19	.44	.66	.68	.09	.62	.60	.50	.42	.56	.59
03				.27	.26	.00	.31	.52	.53	.10	.50	.56	.34	.28	.32	.34
Program Graduates																
04					.26	.07	.48	.58	.53	-.11	.53	.49	.61	.21	.08	.16
05						.24	.36	.39	.40	.19	.34	.43	.26	.08	.20	.18
06							.64	.25	.30	-.12	.17	.16	.05	-.04	.10	.11
07								.63	.63	-.05	.60	.40	.56	.19	.32	.41
Survey Results																
08									.98	.19	.95	.78	.72	.65	.59	.64
09										.21	.91	.75	.66	.63	.61	.66
10											.22	-.08	.14	-.16	.20	.24
11												.74	.77	.62	.62	.68
University Library																
12													.39	.63	.50	.47
Research Support																
13														.37	.35	.46
14															.43	.46
Publication Records																
15																.94
16																

NOTE: Since in computing correlation coefficients program data must be available for both of the measures being correlated, the actual number of programs on which each coefficient is based varies.

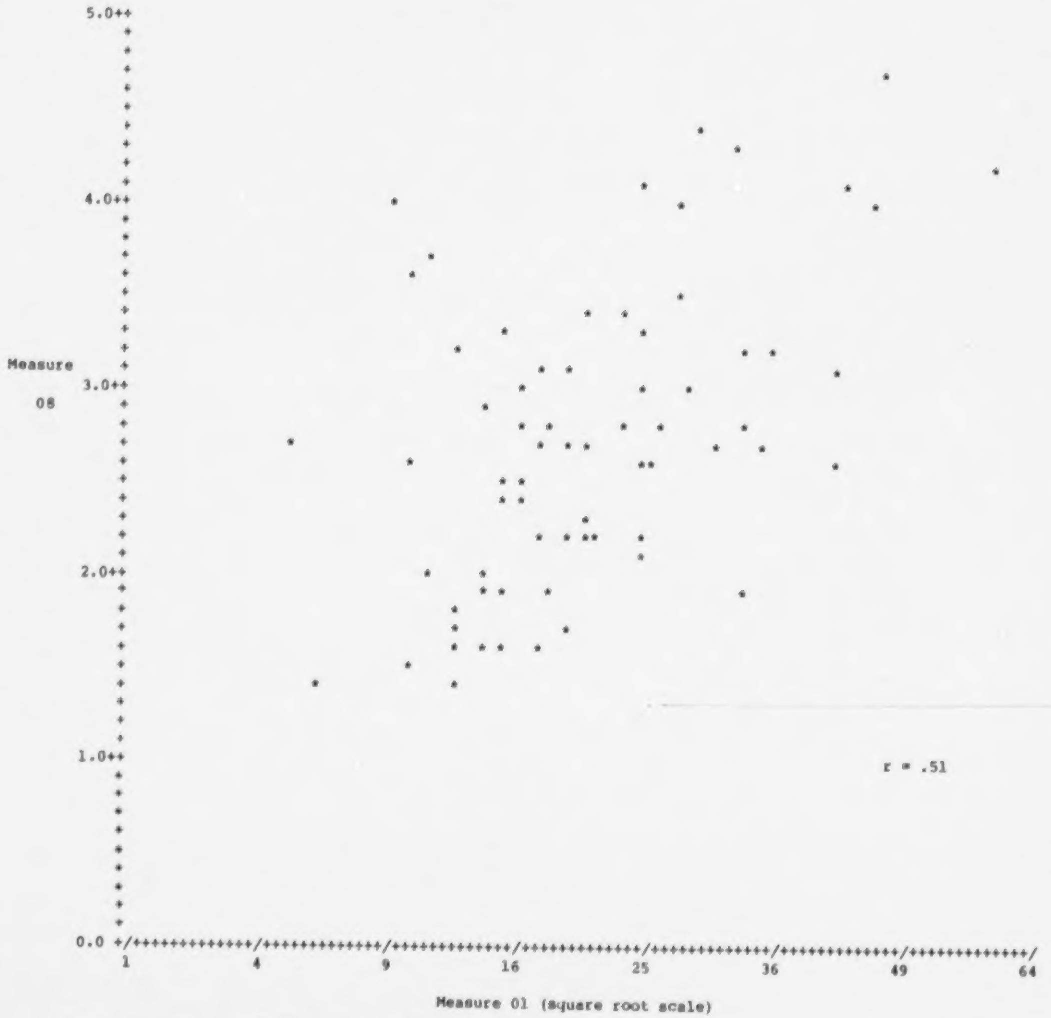

FIGURE 8.1 Mean rating of scholarly quality of faculty (measure 08) versus number of faculty members (measure 01)--69 programs in zoology.

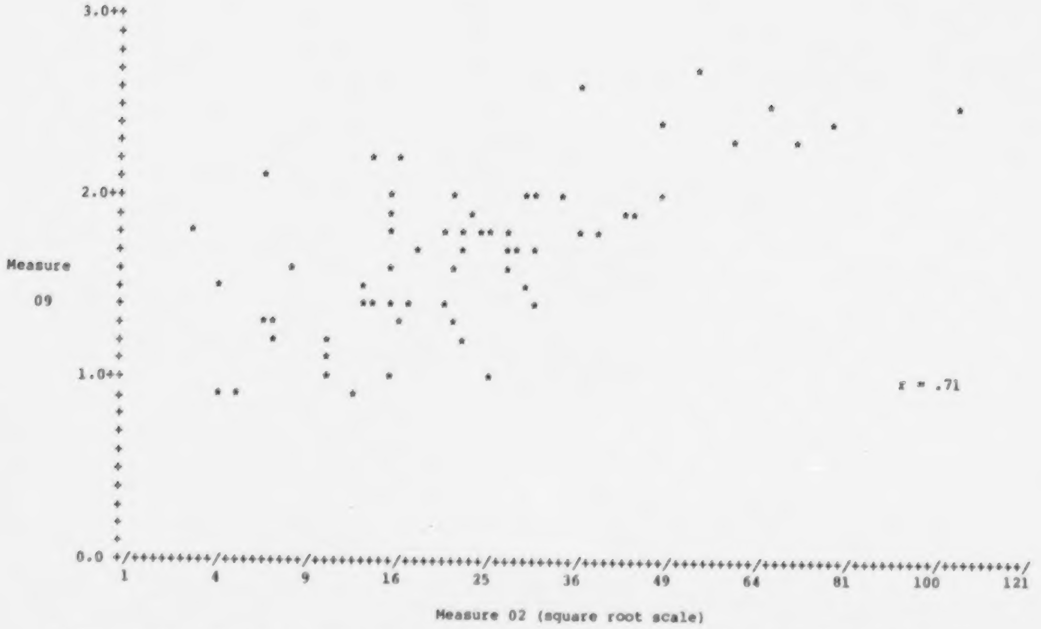

FIGURE 8.2 Mean rating of program effectiveness in educating research scholars/scientists (measure 09) versus number of graduates in last five years (measure 02)--67 programs in zoology.

TABLE 8.4 Characteristics of Survey Participants in Zoology

	Respondents	
	N	%
Field of Specialization		
Cell Biology	17	14
Ecology	35	29
Physiology, Animal/Human	14	11
Zoology	33	27
Other/Unknown	24	20
Faculty Rank		
Professor	55	45
Associate Professor	45	37
Assistant Professor	23	19
Year of Highest Degree		
Pre-1950	7	6
1950-59	16	13
1960-69	50	41
Post-1969	49	40
Unknown	1	1
Evaluator Selection		
Nominated by Institution	105	85
Other	18	15
Survey Form		
With Faculty Names	110	89
Without Names	13	11
Total Evaluators	123	100

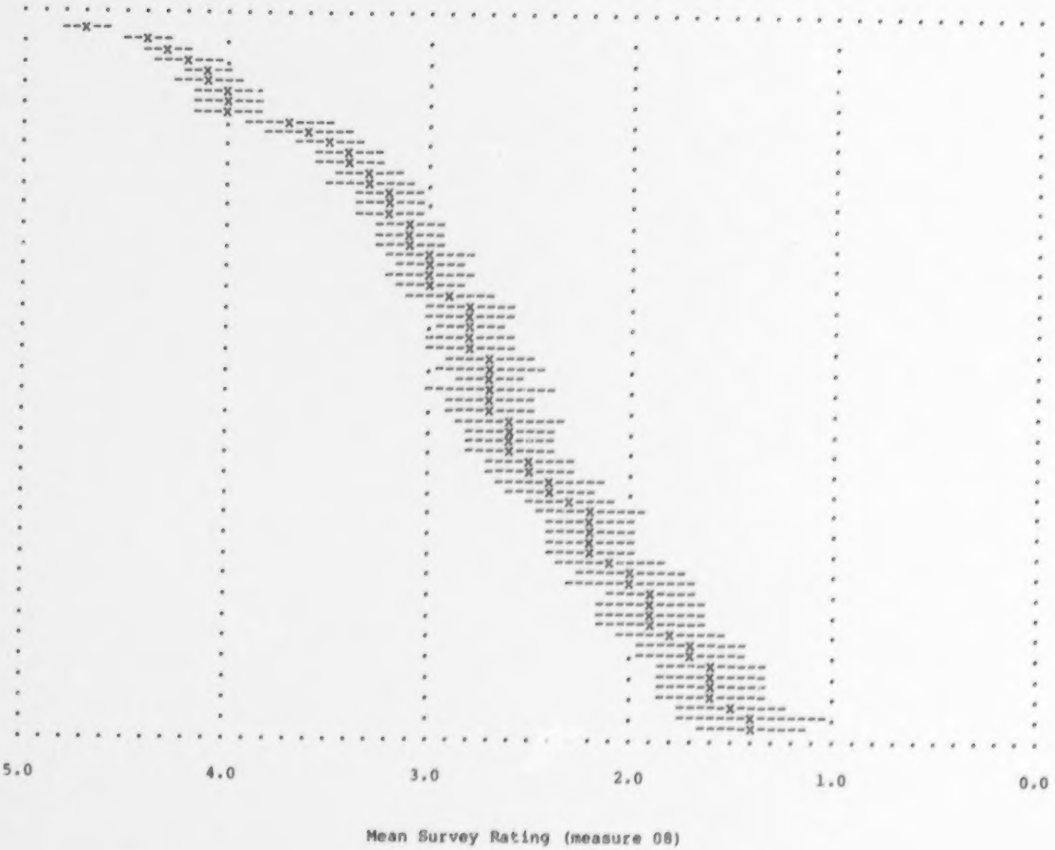

FIGURE 8.3 Mean rating of scholarly quality of faculty in 69 programs in zoology.

NOTE: Programs are listed in sequence of mean rating, with the highest-rated program appearing at the top of the page. The broken lines (---) indicate a confidence interval of ±1.5 standard errors around the reported mean (x) of each program.

IX
Summary and Discussion

In the six preceding chapters results are presented of the assessment of 616 research-doctorate programs in biochemistry, botany, cellular/molecular biology, microbiology, physiology, and zoology. Included in each chapter are summary data describing the means and intercorrelations of the program measures in a particular discipline. In this chapter a comparison is made of the summary data reported in the six disciplines. Also presented here are an analysis of the reliability (consistency) of the reputational survey ratings and an examination of some factors that might possibly have influenced the survey results. This chapter concludes with suggestions for improving studies of this kind--with particular attention given to the types of measures one would like to have available for an assessment of research-doctorate programs.

This chapter necessarily involves a detailed discussion of various statistics (means, standard deviations, correlation coefficients) describing the measures. Throughout, the reader should bear in mind that all these statistics and measures are necessarily imperfect attempts to describe the real quality of research-doctorate programs. Quality and some differences in quality are real, but these differences cannot be subsumed completely under any one quantitative measure. For example, no single numerical ranking--by measure 08 or by any weighted average of measures--can rank the quality of different programs with precision.

However, the evidence for reliability indicates considerable stability in the assessment of quality. For instance, a program that comes out in the first decile of a ranking is quite unlikely to "really" belong in the third decile, or vice versa. If numerical ranks of programs were replaced by groupings (distinguished, strong, etc.), these groupings again would not fully capture actual differences in quality since there would likely be substantial ambiguity about the borderline between adjacent groups. Furthermore, any attempt at linear ordering (best, next best, . . .) may also be inaccurate. Programs of roughly comparable quality may be better in different ways, so that there simply is no one best program--as will also be indicated in some of the numerical analyses. However, these difficulties of formulating ranks should not hide the underlying reality of differences in quality or the importance of high quality for effective doctoral education.

SUMMARY OF THE RESULTS

Displayed in Table 9.1 are the numbers of programs evaluated (bottom line) and the mean values for each measure in the six biological science disciplines.[1] As can be seen, the mean values reported for individual measures vary considerably among disciplines. The pattern of means on each measure is summarized below, but the reader interested in a detailed comparison of the distribution of a measure should refer to the second table in each of the preceding chapters.[2]

Program Size (Measures 01-03). Based on the information provided to the committee by the study coordinator at each university, cellular/molecular biology programs had, on the average, the largest number of faculty members (26 in December 1980), followed by zoology (21). Zoology programs graduated the most students (26 Ph.D. recipients in the FY1975-79 period), and cellular/molecular programs had the largest enrollment (34 doctoral students in December 1980). In contrast, physiology programs were reported to have an average of 19 faculty members, 14 graduates, and 16 doctoral students.

Program Graduates (Measures 04-07). The mean fraction of FY1975-79 doctoral recipients who as graduate students had received some national fellowship or training grant support (measure 04) ranges from .21 for graduates of botany programs to .59 for graduates in cellular/molecular biology. The relatively high fraction of support in cellular/molecular biology, biochemistry, microbiology, and physiology may be explained by the availability of National Institutes of Health (NIH) training grant support for graduate students in these disciplines. With respect to the median number of years from first enrollment in a graduate program to receipt of the doctorate (measure 05), graduates in biochemistry, cellular/molecular biology, microbiology, and physiology typically earned their degrees approximately a year sooner than graduates in zoology. In terms of employment status at graduation (measure 06), an average of 80 percent or more of the Ph.D. recipients in these same four disciplines reported that they had made firm job commitments by the time they had completed requirements for their degrees, contrasted with 65 percent of the program graduates in zoology and 67 percent in botany. A mean of 56 percent (or higher) of the program graduates in biochemistry, cellular/molecular biology, and physiology reported that they had made firm commitments to take positions in Ph.D.-granting institutions (measure 07), while only 30 percent of those in zoology and 32 percent in botany had made such plans.

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[1] Means for measure 16, publication "influence," are omitted since arbitrary scaling of this measure prevents meaningful comparisons across disciplines.

[2] The second table in each of the six earlier chapters presents the standard deviation and decile values for each measure.

TABLE 9.1 Mean Values for Each Program Measure, by Discipline

	Bio-chemistry	Botany	Cell./Molec. Biology	Micro-biology	Physi-ology	Zoology
Program Size						
01	19	19	26	16	19	21
02	20	19	23	16	14	26
03	25	20	34	20	16	33
Program Graduates						
04	.47	.21	.59	.48	.53	.33
05	6.0	6.5	6.1	6.1	6.2	7.1
06	.81	.67	.80	.80	.80	.65
07	.56	.32	.56	.48	.57	.30
Survey Results						
08	2.6	3.0	2.9	2.8	3.0	2.7
09	1.7	1.8	1.9	1.8	1.9	1.7
10	1.2	1.2	1.2	1.2	1.2	1.2
11	.7	.7	.7	.6	.6	.7
University Library						
12	.2	.3	.3	.3	.3	.3
Research Support						
13	.63	.28	.64	.45	.52	.36
14	8419	8406	10243	8449	8687	8806
Publication Records						
15	92	60	133	46	17	16
Total Programs	139	83	89	134	101	70

Survey Results (Measures 08-11). Differences in the mean ratings derived from the reputational survey are small. In all six disciplines the mean rating of scholarly quality of program faculty (measure 08) is at or slightly below 3.0 ("good"), and programs were judged to be, on the average, "reasonably" (2.0) to "moderately" (1.0) effective in educating research scholars/scientists (measure 09). In the opinions of the survey respondents, there has been "slight improvement" (an average of 1.2 in each discipline on measure 10) in the last five years in the overall average quality of programs. The mean rating of an evaluator's familiarity with the work of program faculty (measure 11) falls below 1.0 ("some familiarity") in every discipline--about which more will be said later in this chapter.

The reader should be reminded that the distribution of ratings may vary from one discipline to another. If one examines, for example, the top program ratings recorded for measure 08 in each discipline, one finds noticeably higher top ratings in biochemistry (two programs with ratings above 4.8) and cellular/molecular biology (three programs with ratings above 4.7) than in either botany or physiology (no programs with ratings above 4.5). The study committee does not have an explanation of this observation but wishes to emphasize that many differences may be found in the distributions of survey ratings in the various disciplines and that the determinants of these differences are not known. As discussed in Chapter II, the survey ratings reflect each program's standing relative to other programs in the same discipline and provide no basis for making comparisons across disciplines.

University Library (Measure 12). Measure 12, based on a composite index of the size[3] of the library in the university in which a program resides, is calculated on a scale from -2.0 to 3.0, with means ranging from .2 in biochemistry to .3 in the other five disciplines. As mentioned earlier in this report, these data are not available for many of the smaller universities. Were the program coverage complete for this measure, it is likely that the reported means would be significantly lower.

Research Support (Measures 13-14). Measure 13, the proportion of program faculty who had received NIH, NSF, or ADAMHA[4] research grant awards during the FY1978-80 period, has mean values ranging from as high as .64 and .63 in cellular/molecular biology and biochemistry, respectively, to .28 in botany. It should be emphasized that this measure does not take into account research support that faculty members have received from sources other than these three federal agencies. In terms of total university expenditures for R&D in the biological sciences (measure 14), the mean values are reported to range from $8,406,000 in botany to $10,243,000 in cellular/molecular biology. In considering this measure it must be remembered that it reflects the overall university expenditures in the biological sciences and not expenditures in individual disciplines within the biological sciences.

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[3] The index, derived by the Association of Research Libraries, reflects a number of different measures, including number of volumes, fiscal expenditures, and other factors relevant to the size of a university library. See the description of this measure presented in Appendix D.

[4] National Institutes of Health; National Science Foundation; and Alcohol, Drug Abuse, and Mental Health Administration.

Publication Records (Measures 15 and 16). Considerable diversity is also found in the mean number of articles associated with a research-doctorate program (measure 15). An average of 133 articles published in the 1978-79 period is reported for programs in cellular/molecular biology and 92 articles for programs in biochemistry; in physiology and zoology the mean number of articles is fewer than 20. These large differences reflect several factors, including the program size in a particular discipline (i.e., the total number of faculty and other staff members involved in research), the frequency with which scientists in that discipline publish, and the length of a typical paper in a discipline. Another important factor is the fact that journals in biochemistry and cellular/molecular biology far outnumber those in the other four biological disciplines. (As decribed in Chapter II, data on published articles were identified by field of journal--not by matching the names of program faculty with authors' names.) Mean scores are not reported on measure 16, the estimated "overall influence" of the articles attributed to a program. Since this measure is calculated from an average of journal influence weights,[5] normalized for the journals covered in a particular discipline, mean differences between disciplines are uninterpretable.

CORRELATIONS AMONG MEASURES

Relations among the program measures are of intrinsic interest and are relevant to the issue of validity of the measures as indices of the quality of a research-doctorate program. Measures that are logically related to program quality are expected to be related to each other. To the extent that they are, a stronger case might be made for the validity of each as a quality measure.

A reasonable index of the relationship between any two measures is the Pearson product-moment correlation coefficient. A table of correlation coefficients of all possible pairs of measures is presented in each of the six preceding chapters. This chapter presents selected correlations to determine the extent to which coefficients are comparable in the six disciplines. Special attention is given to the correlations involving the number of FY1975-79 program graduates (measure 02), survey rating of the scholarly quality of program faculty (measure

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[5] See Appendix F for a description of the derivation of this measure.

08), university R&D expenditures in a particular discipline (measure 14), and the influence-weighted number of publications (measure 16). These four measures have been selected because of their relatively high correlations with several other measures. Readers interested in correlations other than those presented in Tables 9.2-9.5 may refer to the third table in each of the preceding six chapters.

Correlations with Measure 02. Table 9.2 presents the correlations of measure 02 with each of the other measures used in the assessment. As might be expected, correlations of this measure with the other two measures of program size--the number of faculty (01) and doctoral student enrollment (03)--are moderately high in all six disciplines. Of greater interest are the strong positive correlations between measure 02 and measures derived from the reputational survey ratings (08, 09, and 11). In biochemistry and zoology these coefficients are all above .60; in cellular/molecular biology, microbiology, and physiology most of the coefficients are above .40. In botany the correlations are somewhat lower. It is quite apparent that the programs that received high survey ratings and with which evaluators were more likely to be familiar were also ones that had larger numbers of graduates. Although the committee gave serious consideration to presenting an alternative set of survey measures that were adjusted for program size, a satisfactory algorithm for making such an adjustment was not found. In attempting such an adjustment on the basis of the regression of survey ratings on measures of program size, it was found that some exceptionally large programs appeared to be unfairly penalized and that some very small programs received unjustifiably high adjusted scores.

Measure 02 also has positive correlations in most disciplines with measure 12, an index of university library size, with measures 13 and 14, which pertain to the level of support for research in a program, and with measures 15 and 16, which reflect publication productivity. Of particular note are the moderately large coefficients--in disciplines other than botany and physiology--for the latter two measures. The relation of the number of program graduates and the publication records of that program is especially strong in biochemistry and zoology. The correlations of measure 02 with measures 04, 05, 06, and 07 are below .20 in all disciplines except biochemistry and zoology. From this analysis it is apparent that the number of program graduates tends to be positively correlated with all other variables except those pertaining to recent program graduates (04-07). It is also apparent that the relationship of measure 02 with the other variables tends to be strongest for programs in biochemistry and zoology.

Correlations with Measure 08. Table 9.3 shows the correlation coefficients for measure 08, the mean rating of the scholarly quality of program faculty, with each of the other variables. The correlations of measure 08 with measures of program size (01, 02, and 03) are typically greater than .40. Not surprisingly, the larger the program, the more likely its faculty is to be rated high in quality.

Correlations of measure 08 with measure 04, the fraction of students with national fellowship or traineeship awards, are .47 or

TABLE 9.2 Correlations of the Number of Program Graduates (Measure 02) with Other Measures, by Discipline

	Bio-chemistry	Botany	Cell./Molec. Biology	Micro-biology	Physi-ology	Zoology
Program Size						
01	.48	.42	.54	.61	.43	.66
03	.72	.55	.83	.80	.54	.78
Program Graduates						
04	.47	-.14	.16	.18	-.09	.27
05	.16	.04	-.11	.02	.19	.25
06	.23	-.06	.12	.07	.14	.19
07	.27	-.07	-.02	.12	.15	.44
Survey Results						
08	.63	.29	.42	.48	.46	.66
09	.67	.34	.47	.55	.51	.68
10	.14	.11	.09	.19	.19	.09
11	.63	.27	.40	.58	.32	.62
University Library						
12	.46	-.01	.19	.27	.25	.60
Research Support						
13	.35	.03	.18	.20	.04	.50
14	.46	.09	.02	.18	.30	.42
Publication Records						
15	.66	.23	.32	.44	.16	.56
16	.65	.24	.34	.29	.17	.59

TABLE 9.3 Correlations of the Survey Ratings of Scholarly Quality of Program Faculty (Measure 08) with Other Measures, by Discipline

	Bio-chemistry	Botany	Cell./Molec. Biology	Micro-biology	Physi-ology	Zoology
Program Size						
01	.58	.56	.39	.50	.64	.53
02	.63	.29	.42	.48	.46	.66
03	.60	.51	.43	.42	.42	.52
Program Graduates						
04	.70	.31	.58	.57	.47	.58
05	.15	.26	.38	.08	-.11	.39
06	.24	.36	.33	.23	.27	.25
07	.35	.59	.41	.38	.30	.63
Survey Results						
09	.96	.97	.96	.96	.95	.98
10	.21	.29	.33	.46	.38	.19
11	.96	.83	.94	.91	.89	.95
University Library						
12	.63	.66	.47	.54	.49	.78
Research Support						
13	.62	.49	.58	.64	.57	.72
14	.69	.62	.57	.68	.51	.65
Publication Records						
15	.83	.60	.69	.72	.69	.59
16	.83	.62	.71	.75	.71	.64

greater in all disciplines except botany. For programs in the mathematical and physical sciences and in engineering, the corresponding coefficients (reported in earlier volumes) are found to be considerably lower, typically in the range of .10 to .30. In the biological sciences (especially in the biomedical fields), there is a far greater reliance on training grant and fellowship support, and fewer graduate students are supported by research assistantships or teaching assistantships. Correlations of rated faculty quality with measure 05, the shortness of time from matriculation in graduate school to award of the doctorate, are small but positive for programs in botany, cellular/molecular biology, and zoology and close to zero for programs in the other three disciplines.

Correlations of ratings of faculty quality with measure 06, the fraction of program graduates with definite employment plans, range between .23 and .36 in the six biological disciplines. In every discipline the correlation of measure 08 is higher with measure 07, the fraction of graduates having agreed to employment at a Ph.D.-granting institution. These coefficients are approximately .60 in botany and zoology and .30 or above in the other four disciplines. Thus, those programs with the larger fractions of graduates intending to take academic positions tended to receive higher survey ratings.

The correlations of measure 08 with measure 09, the rated effectiveness of doctoral education, are uniformly very high, at or above .95 in every discipline. This finding is consistent with results from the Cartter and Roose-Andersen studies.[6] The coefficients describing the relationship between measure 08 and measure 11, the familiarity with the work of program faculty, are also very high, ranging from .83 to .96. In general, evaluators were more likely to have high regard for the quality of faculty in those programs with which they were most familiar. That the correlation coeffients are as large as observed may simply reflect the fact that "known" programs tend to be those that have earned strong reputations.

Correlations of ratings of faculty quality with measure 10, the ratings of perceived improvement in program quality, are much smaller--ranging from .19 in zoology to .46 in microbiology. One might have expected that a program judged to have improved in quality would have been somewhat more likely to receive high ratings on measure 08 than would a program judged to have declined--thereby imposing a small positive correlation between these two variables.

Moderately high correlations are observed in most disciplines between measure 08 and university library size (measure 12), support for research (measures 13 and 14), and publication records (measures 15 and 16). With few exceptions these coefficients are .50 or greater in all disciplines. Of particular note are the strong correlations with the two publication measures--as high as .83 in biochemistry. In all disciplines the correlations with measure 16 are as high as or slightly higher than those with measure 15; the "weighted influence" of journals in which articles are published yields an index that tends to relate more closely to faculty reputation than does an unadjusted count of the number of articles published. Although the observed differences between the coefficients for measures 15 and 16 are not large, this result is consistent with earlier findings of Anderson et al.[7]

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[6] Roose and Andersen, p. 19.

Correlations with Measure 14. Correlations of measure 14, the reported dollars of support for R&D, with other measures are shown in Table 9.4. The reader is reminded that this measure reflects total university expenditures in the biological sciences and not expenditures in the six separate biological science disciplines. The pattern of relations is quite similar for programs in all six disciplines: moderately high correlations with reputational survey results (except measure 10), university library size, and publication measures. Measure 14 is also positively correlated with measures of program size (01-03), the fraction of recent graduates with fellowship/traineeship support (04), the fraction with definite commitments for employment in Ph.D.-granting universities (07), and the fraction of program faculty with federal research grants (13). In interpreting these relationships one must keep in mind the fact that the research expenditure data have not been adjusted for the number of faculty and other staff members involved in research in a program.

Correlations with Measure 16. Measure 16 is the number of published articles attributed to a program and adjusted for the "average influence" of the journals in which the articles appear. The correlations of this measure with all others appear in Table 9.5. Of particular interest are the high correlations with the reputational survey results (excluding measure 10). All of those coefficients exceed .60, and for biochemistry programs the coefficients are approximately .80. Moderately high correlations are also observed between measure 16 and measures 12, 13, and 14; with few exceptions these correlations are .40 or higher. It should be pointed out that the exceptionally large coefficients reported for measure 15 result from the fact that the two publication measures are logically as well as empirically interdependent.

Despite the appreciable correlations between reputational ratings of quality and program size measures, the functional relations between the two probably are complex. If there is a minimum size for a high-quality program, this size is likely to vary from discipline to discipline. Increases in size beyond the minimum may represent more high-quality faculty, or a greater proportion of inactive faculty, or a faculty with heavy teaching responsibilities. In attempting to select among these alternative interpretations, a single correlation coefficient provides insufficient guidance. Nonetheless, certain similarities across disciplines may be seen in the correlations among the measures. High correlations consistently appear among measures 08, 09, and 11 from the reputational survey, and these measures also are prom-

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[7] Anderson, Narin, and McAllister, p. 95.

TABLE 9.4 Correlations of the University Research Expenditures in a Discipline (Measure 14) with Other Measures, by Discipline

	Bio-chemistry	Botany	Cell./Molec. Biology	Micro-biology	Physi-ology	Zoology
Program Size						
01	.33	.31	.16	.24	.36	.20
02	.46	.09	.02	.18	.30	.42
03	.27	.17	.02	.08	.37	.28
Program Graduates						
04	.50	.20	.30	.43	.31	.21
05	.03	.12	.25	.05	-.16	.08
06	.12	.04	.18	.12	.14	-.04
07	.29	.28	.20	.27	.23	.19
Survey Results						
08	.69	.62	.57	.68	.51	.65
09	.64	.61	.47	.65	.51	.63
10	.03	-.07	-.16	.12	-.01	-.16
11	.69	.48	.58	.50	.46	.62
University Library						
12	.56	.55	.42	.48	.50	.63
Research Support						
13	.30	.36	.24	.29	.28	.37
Publication Records						
15	.71	.47	.58	.73	.43	.43
16	.71	.52	.59	.78	.48	.46

TABLE 9.5 Correlations of the Influence-Weighted Number of Publications (Measure 16) with Other Measures, by Discipline

	Bio-chemistry	Botany	Cell./Molec. Biology	Micro-biology	Physi-ology	Zoology
Program Size						
01	.58	.55	.37	.38	.52	.36
02	.65	.24	.34	.29	.17	.59
03	.55	.32	.35	.18	.14	.34
Program Graduates						
04	.62	-.11	.42	.51	.50	.16
05	.12	.16	.29	-.03	-.12	.18
06	.22	.18	.26	.13	.29	.11
07	.34	.26	.32	.27	.33	.41
Survey Results						
08	.83	.62	.71	.75	.71	.64
09	.79	.63	.61	.68	.65	.66
10	.28	.24	.17	.27	.20	.24
11	.85	.56	.74	.62	.81	.68
University Library						
12	.66	.37	.59	.54	.37	.47
Research Support						
13	.47	.04	.40	.40	.51	.46
14	.71	.52	.59	.78	.48	.46
Publication Records						
15	.98	.96	.99	.90	.97	.94

inently related to program size (measures 01, 02, and 03), to publication productivity (measures 15 and 16), to R&D expenditures (measure 14), and to library size (measure 12). These results show that for all disciplines the reputational rating measures (08, 09, and 11) tend to be associated with program size and with other correlates of size: publication volume, R&D expenditures, and library size. Also, for most disciplines the reputational measures 08, 09, and 11 tend to be positively related to fellowship/traineeship support (measure 04), to employment prospects of program graduates (especially measure 07), and to the fraction of faculty holding research grants (measure 13).

ANALYSIS OF THE SURVEY RESPONSE

Measures 08-11, derived from the reputational survey, may be of particular interest to many readers since measures of this type have been the most widely used (and frequently criticized) indices of quality of graduate education. In designing the survey instrument for this assessment the committee made several changes in the form that had been used in the Roose-Andersen study. The modifications served two purposes: to provide the evaluators with a clearer understanding of the programs that they were asked to judge and to provide the committee with supplemental information for the analysis of the survey response. One change was to restrict to 50 the number of programs that any individual was asked to evaluate. Probably the most important change was the inclusion of lists of names and ranks of individual faculty members involved in the research-doctorate programs to be evaluated on the survey form, together with the number of doctoral degrees awarded in the previous five years. Ninety percent of the evaluators were sent forms with faculty names and numbers of degrees awarded; the remaining 10 percent were given forms without this information, so that an analysis could be made of the effect of this modification on survey results. Another change was the addition of a question concerning an evaluator's familiarity with each of the programs. In addition to providing an index of program recognition (measure 11), the inclusion of this question permits a comparison between the ratings furnished by individuals who had considerable familiarity with a particular program and the ratings by those not as familiar with the program. Each evaluator was also asked to identify his or her own institution of highest degree and current field of specialization. This information enables us to compare, for each program, the ratings furnished by alumni of that institution with the ratings by other evaluators, as well as to examine differences in the ratings supplied by evaluators in certain specialty fields.

Before examining factors that may have influenced the survey results, some mention should be made of the distributions of responses to the four survey items and the reliability (consistency) of the ratings. For example, in judging the scholarly quality of faculty (measure 08), survey respondents in each discipline rated between 5 and 8 percent of the programs as being "distinguished" and approximately 1 percent as "not sufficient for doctoral education" (see Table 9.6). In evaluating the effectiveness in educating research scholars/scientists,

TABLE 9.6 Distribution of Responses to Each Survey Item, by Discipline

	Survey Measure	Total	Bio- chem.	Botany	Cell./ Molec.	Micro- biology	Physi- ology	Zoology
08	SCHOLARLY QUALITY OF PROGRAM FACULTY							
	Distinguished	6.3	7.0	5.9	8.1	5.3	6.0	5.4
	Strong	14.5	12.7	16.1	16.9	14.1	14.4	14.5
	Good	16.9	17.0	16.7	17.8	17.0	14.7	18.5
	Adequate	10.3	12.0	8.8	8.6	10.5	8.1	12.8
	Marginal	3.9	5.5	2.8	3.1	3.5	2.9	4.9
	Not Sufficient for Doctoral Education	1.1	1.4	1.1	1.0	1.0	.8	1.3
	Don't Know Well Enough to Evaluate	47.0	44.5	48.5	44.4	48.5	53.3	42.6
	TOTAL	100.0	100.0	100.0	100.0	100.0	100.0	100.0
09	EFFECTIVENESS OF PROGRAM IN EDUCATING SCIENTISTS							
	Extremely Effective	7.2	7.2	7.6	8.1	6.8	6.7	6.9
	Reasonably Effective	24.6	22.3	27.7	22.4	25.4	22.0	28.8
	Minimally Effective	8.4	8.6	8.1	6.7	8.4	7.4	11.0
	Not Effective	1.4	1.6	1.1	1.3	1.2	1.1	2.4
	Don't Know Well Enough to Evaluate	58.5	60.3	55.5	61.5	58.2	62.7	51.0
	TOTAL	100.0	100.0	100.0	100.0	100.0	100.0	100.0
10	CHANGE IN PROGRAM QUALITY IN LAST FIVE YEARS							
	Better	9.8	8.5	10.2	11.1	9.9	8.4	11.5
	Little or No Change	19.6	19.3	22.6	18.3	18.4	17.6	22.1
	Poorer	3.8	3.6	3.8	3.8	3.6	3.7	4.5
	Don't Know Well Enough to Evaluate	66.9	68.6	63.4	66.7	68.1	70.3	61.9
	TOTAL	100.0	100.0	100.0	100.0	100.0	100.0	100.0
11	FAMILIARITY WITH WORK OF PROGRAM FACULTY							
	Considerable	15.2	13.8	17.4	18.4	15.1	12.1	15.0
	Some	34.3	36.3	31.5	34.0	33.5	32.6	37.5
	Little or None	47.8	46.2	48.3	44.3	50.3	50.9	45.7
	No Response	2.8	3.6	2.8	3.3	1.1	4.4	1.8
	TOTAL	100.0	100.0	100.0	100.0	100.0	100.0	100.0

NOTE: For survey measures 08, 09, 10 the "don't know" category includes a small number of cases for which the respondents provided no response to the survey item.

they rated 7 to 8 percent of the programs as being "extremely effective" and approximately 1 to 2 percent as "not effective." Of particular interest in this table are the frequencies with which evaluators failed to provide responses to measures 08, 09, and 10. Approximately 47 percent of the total number of evaluations requested for measure 08 were not furnished because survey respondents in the biological sciences felt that they were not familiar enough with a particular program to evaluate it. The corresponding percentages of "don't know" responses for measures 09 and 10 are considerably larger--58 and 67 percent, respectively--suggesting that survey respondents found it more difficult (or were less willing) to judge program effectiveness and change than to judge the scholarly quality of program faculty. The percentages of "don't know" responses are greater in the biological disciplines than in most other science, engineering, or humanities disciplines. This finding may be attributed, in part, to the fact that many different academic units or departmental fields are represented in the assessment in each biological discipline and that survey evaluators were less likely to be familiar with programs outside their own fields of specialty.

The large fractions of "don't know" responses are a matter of some concern. However, given the broad coverage of research-doctorate programs, it is not surprising that faculty members would be unfamiliar with many of the less distinguished programs. As shown in Table 9.7, survey respondents in each discipline were much more likely to furnish evaluations for programs with high reputational standing than they were for programs of lesser distinction. For example, for biological science programs that received mean ratings of 4.0 or higher on measure 08, almost 85 percent of the evaluations requested on measure 08 were provided; 72 and 57 percent, respectively, were provided on measures 09 and 10. In contrast, the corresponding response rates for programs with mean ratings below 2.0 are much lower--30, 22, and 16 percent response on measures 08, 09, and 10, respectively.

Of great importance to the interpretation of the survey results is the reliability of the responses. How much confidence can one have in the reliability of a mean rating reported for a particular program? In the second table in each of the preceding six chapters, estimated standard errors associated with the mean ratings of every program are presented for all four survey items (measures 08-11). While there is some variation in the magnitude of the standard errors reported in every discipline, they rarely exceed .20 for any of the four measures and typically range from .10 to .15. For programs with higher mean ratings the estimated errors associated with these means are generally smaller--a finding consistent with the fact that survey respondents were more likely to furnish evaluations for programs with high reputational standing. The "split-half" correlations[8] presented in Table 9.8

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[8] For a discussion of the interpretation of "split-half" coefficients, see Robert L. Thorndike and Elizabeth Hagan, Measurement and Evaluation in Psychology and Education, John Wiley & Sons, New York, 1969, pp. 182-185.

TABLE 9.7 Survey Item Response Rates, by Discipline and Mean Rating on Measure 08

Survey Measure	Total	Bio-chem.	Botany	Cell./ Molec.	Micro-biology	Physi-ology	Zoology
08 SCHOLARLY QUALITY OF PROGRAM FACULTY							
Mean Rating on Measure 08							
4.0 or Higher	84.7	95.9	67.7	89.9	82.0	81.6	91.1
3.0 - 3.9	65.9	76.0	57.9	72.6	64.2	57.0	75.4
2.0 - 2.9	44.8	48.8	43.9	43.8	44.1	36.3	50.1
Less than 2.0	29.9	32.2	34.2	23.4	27.6	21.8	35.3
09 EFFECTIVENESS OF PROGRAM IN EDUCATING SCIENTISTS							
Mean Rating on Measure 08							
4.0 or Higher	72.2	78.3	61.5	72.3	69.9	70.9	83.4
3.0 - 3.9	52.3	56.1	51.3	49.7	52.5	45.1	65.2
2.0 - 2.9	33.8	33.5	36.5	27.7	35.1	28.1	41.6
Less than 2.0	21.6	19.8	26.7	15.6	21.9	18.1	29.1
10 CHANGE IN PROGRAM QUALITY IN LAST FIVE YEARS							
Mean Rating on Measure 08							
4.0 or Higher	57.3	62.0	51.4	60.5	51.3	56.0	64.4
3.0 - 3.9	42.5	45.3	43.2	44.1	39.9	36.1	51.7
2.0 - 2.9	27.1	26.8	29.2	24.6	27.3	22.6	32.2
Less than 2.0	15.9	14.0	20.0	11.7	16.5	13.4	21.6

give an indication of the overall reliability of the survey results in each discipline and for each measure. In the derivation of these correlations individual ratings of each program were randomly divided into two groups (A and B), and a separate mean rating was computed for each group. The last column in Table 9.8 reports the correlations between the mean program ratings of the two groups and is not corrected for the fact that the mean ratings of each group are based on only half rather than a full set of responses.[9] As the reader will note, the coefficients reported for measure 08, the scholarly quality of program faculty, are in the range of .91 to .96--indicating a high degree of consistency in evaluators' judgments. The correlations reported for measures 09 and 11, the rated effectiveness of a program and the evaluators' familiarity with a program, are somewhat lower but still at a level of .87 or higher in every discipline, except physiology. Not surprisingly, the reliability coefficients for ratings of change in program quality in the last five years (measure 10) are considerably lower, ranging from .48 to .68 in the six biological science disci-

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[9] To compensate for the smaller sample size the "split-half" coefficient may be adjusted using the Spearman-Brown formula:
$r' = 2r/(1 + r)$. This adjustment would have the effect of increasing a correlation of .70, for example, to .82, a correlation of .80 to .89, a correlation of .90 to .95, and a correlation of .95 to .97.

TABLE 9.8 Correlations Between Two Sets of Average Ratings from Two Randomly Selected Groups of Evaluators in the Biological Sciences

MEASURE 08: SCHOLARLY QUALITY OF PROGRAM FACULTY

Discipline	Mean Rating		Std. Deviation		Correlation	
	Group A	Group B	Group A	Group B	N	r
Biochemistry	2.65	2.62	.94	.98	138	.96
Botany	3.02	3.03	.84	.82	83	.95
Cell/Molec. Biol.	2.86	2.90	1.02	.97	88	.96
Microbiology	2.83	2.81	.79	.82	134	.93
Physiology	2.93	2.94	.83	.77	101	.91
Zoology	2.71	2.74	.84	.78	70	.95

MEASURE 09: EFFECTIVENESS OF PROGRAM IN EDUCATING SCHOLARS

Discipline	Mean Rating		Std. Deviation		Correlation	
	Group A	Group B	Group A	Group B	N	r
Biochemistry	1.67	1.63	.52	.54	138	.88
Botany	1.82	1.84	.45	.45	83	.90
Cell/Molec. Biol.	1.73	1.75	.52	.53	88	.89
Microbiology	1.75	1.76	.45	.42	134	.87
Physiology	1.76	1.76	.43	.46	101	.81
Zoology	1.66	1.69	.45	.45	70	.89

MEASURE 10: IMPROVEMENT IN PROGRAM IN LAST FIVE YEARS

Discipline	Mean Rating		Std. Deviation		Correlation	
	Group A	Group B	Group A	Group B	N	r
Biochemistry	1.11	1.12	.27	.24	138	.55
Botany	1.15	1.17	.20	.22	83	.64
Cell/Molec. Biol.	1.17	1.17	.29	.27	88	.48
Microbiology	1.14	1.15	.28	.28	134	.68
Physiology	1.13	1.12	.27	.28	101	.55
Zoology	1.17	1.15	.21	.24	70	.64

MEASURE 11: FAMILIARITY WITH WORK OF PROGRAM FACULTY

Discipline	Mean Rating		Std. Deviation		Correlation	
	Group A	Group B	Group A	Group B	N	r
Biochemistry	.67	.65	.42	.42	138	.95
Botany	.68	.68	.30	.29	83	.87
Cell/Molec. Biol.	.72	.73	.43	.44	88	.95
Microbiology	.64	.64	.34	.33	134	.90
Physiology	.58	.61	.32	.32	101	.87
Zoology	.68	.69	.36	.36	70	.92

plines. While these coefficients represent tolerable reliability, it is quite evident that the responses to measure 10 are not as reliable as the responses to the other three items. In interpreting program ratings for this measure the reader is urged to refer to the standard error estimates reported with the ratings.

Further evidence of the reliability of the survey responses is presented in Table 9.9. As mentioned in Chapter VI, 11 mathematics programs[10] selected at random were included on a second form sent to 178 survey respondents in this discipline, and 116 individuals (65 percent) furnished responses to the second survey. A comparison of the overall results of the two survey administrations (columns 2 and 4 in Table 9.9) demonstrates the consistency of the ratings provided for each of the 11 programs. The average, absolute observed difference in the two sets of mean ratings is less than 0.1 for each measure. Columns 6 and 8 of Table 9.9 report the results based on the responses of only those evaluators who had been asked to consider a particular program in both administrations of the survey. (For a given program approximately 40-45 percent of the 116 respondents to the second survey had been asked to evaluate that program in the prior survey.) It is not surprising to find comparable small differences in the mean ratings provided by this subgroup of evaluators.

Critics of past reputational studies have expressed concern about the credibility of reputational assessments when evaluators provide judgments of programs about which they may know very little. As already mentioned, survey participants in this study were offered the explicit alternative, "Don't know well enough to evaluate." This response option was quite liberally used for measures 08, 09, and 10, as is shown in Table 9.6. In addition, evaluators were asked to indicate their degree of familiarity with each program. Respondents reported "considerable" familiarity with an average of only one program in every six or seven. While this finding supports the conjecture that many program ratings are based on limited information, the availability of reported familiarity permits us to analyze how ratings vary as a function of familiarity.

This issue can be addressed in more than one way. It is evident from the data reported in Table 9.10 that mean ratings of the scholarly quality of program faculty tend to be higher if the evaluator has considerable familiarity with the program. There is nothing surprising or, for that matter, disconcerting about such an association. When a particular program fails to provoke more than vague images in the evaluator's mind, he or she is likely to take this as some indication that the program is not an extremely lustrous one on the national scene. While visibility and quality are scarcely the same, the world of research in higher education is structured to encourage high quality to achieve high visibility, so that any association of the two is far from spurious.

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[10] Mathematics is the only discipline in which results were obtained from two separate administrations of the survey.

TABLE 9.9 Comparison of Mean Ratings for 11 Mathematics Programs Included in Two Separate Survey Administrations

	Survey Measure	All Evaluators				Evaluators Rating the Same Program in Both Surveys			
		First		Second		First		Second	
		N	$\bar{X}$	N	$\bar{X}$	N	$\bar{X}$	N	$\bar{X}$
Program A	08	100	4.9	114	4.9	50	4.9	50	4.9
	09	90	2.7	100	2.8	42	2.7	43	2.7
	10	74	1.2	83	1.2	38	1.1	34	1.2
	11	100	1.6	115	1.6	50	1.5	50	1.6
Program B	08	94	4.6	115	4.6	48	4.6	50	4.5
	09	81	2.6	91	2.5	40	2.6	39	2.5
	10	69	1.0	82	1.0	37	1.0	36	0.9
	11	98	1.4	116	1.4	50	1.5	50	1.5
Program C	08	86	3.4	103	3.6	42	3.4	44	3.5
	09	56	2.0	66	2.1	28	2.1	29	2.0
	10	55	1.1	62	1.3	30	1.2	27	1.4
	11	99	1.0	116	1.1	50	1.1	50	1.0
Program D	08	74	3.0	93	3.0	37	2.8	38	2.9
	09	50	1.8	48	1.6	27	1.7	16	1.6
	10	46	1.4	52	1.5	24	1.4	23	1.5
	11	90	1.0	113	0.9	46	1.0	46	0.9
Program E	08	69	3.0	95	3.1	39	3.0	46	3.1
	09	40	1.8	60	1.9	25	1.8	30	1.8
	10	36	0.8	58	0.9	24	0.8	29	0.9
	11	96	0.8	115	0.9	52	0.9	52	1.0
Program F	08	63	2.9	90	3.0	26	3.0	32	3.1
	09	35	1.8	46	1.7	10	1.6	13	1.8
	10	32	1.1	43	1.1	11	1.3	12	1.2
	11	95	0.7	115	0.8	43	0.7	44	0.7
Program G	08	69	2.7	92	2.8	39	2.7	39	3.0
	09	35	1.7	45	1.6	17	1.7	19	1.7
	10	36	1.1	43	1.2	17	1.1	19	1.2
	11	85	0.9	116	0.8	46	0.9	46	0.9
Program H	08	58	2.2	73	2.5	36	2.2	37	2.4
	09	32	1.3	43	1.3	22	1.2	19	1.3
	10	30	1.5	39	1.5	20	1.7	17	1.4
	11	90	0.7	116	0.6	51	0.7	52	0.6
Program I	08	55	2.0	74	1.9	30	1.9	30	2.0
	09	33	1.0	41	0.9	19	1.0	18	0.8
	10	27	1.2	31	1.1	15	1.1	13	1.2
	11	99	0.5	115	0.5	50	0.5	50	0.5
Program J	08	51	1.5	67	1.5	26	1.4	28	1.4
	09	31	0.8	36	0.7	14	0.6	14	0.7
	10	26	1.2	23	1.1	14	1.2	12	1.3
	11	96	0.5	113	0.3	49	0.4	48	0.4
Program K	08	33	1.2	48	1.2	17	1.1	21	1.4
	09	19	0.8	21	0.5	11	0.6	8	0.4
	10	12	0.8	15	0.9	5	1.0	5	0.8
	11	99	0.2	114	0.2	48	0.2	47	0.2

TABLE 9.10 Mean Ratings of Scholarly Quality of Program Faculty, by Evaluator's Familiarity with Work of Faculty

	MEAN RATINGS		CORRELATION	
	Considerable	Some/ Little	r	N
Biochemistry	2.99	2.59	.86	133
Botany	3.30	2.90	.85	82
Cellular/Molecular Biology	3.33	2.88	.90	83
Microbiology	3.17	2.73	.89	130
Physiology	3.54	2.83	.77	97
Zoology	3.09	2.62	.88	69

NOTE: N reported in last column represents the number of programs with a rating from at least one evaluator in each of the two groups.

From the data presented in Table 9.10 it is evident that if mean ratings were computed on the basis of the responses of only those most familiar with programs, the values reported for individual programs would be increased. A largely independent question is whether a restriction of this kind would substantially change our sense of the relative standings of programs on this measure. Quite naturally, the answer depends in some degree on the nature of the restriction imposed. For example, if we exclude evaluations provided by those who confessed "little or no" familiarity with particular programs, then the revised mean ratings would be correlated at a level of at least .99 with the mean ratings computed using all of the data. (This similarity arises, in part, because only a small fraction of evaluations are given on the basis of no more than "little" familiarity with the program.)

The third column in Table 9.10 presents the correlation in each discipline between the array of mean ratings supplied by respondents claiming "considerable" familiarity and the mean ratings of those indicating "some" or "little or no" familiarity with particular programs. This coefficient is a rather conservative estimate of agreement since there is not a sufficient number of ratings from those with "considerable" familiarity to provide highly stable means. Were more such ratings available, one might expect the correlations to be higher. However, even in the form presented, the correlations, which are at least .85 in all disciplines but physiology, are high enough to suggest that the relative standing of programs on measure 08 is not greatly affected by the admixtures of ratings from evaluators who recognize that their knowledge of a given program is limited.

As mentioned previously, 90 percent of the survey sample members were supplied the names of faculty members associated with each program to be evaluated, along with the reported number of program graduates (Ph.D. or equivalent degrees) in the previous five years. Since earlier reputational surveys had not provided such information, 10 percent

TABLE 9.11 Item Response Rate on Measure 08, by Selected Characteristics of Survey Evaluators in the Biological Sciences

	Total	Bio-chem.	Botany	Cell./ Molec.	Micro-biology	Physi-ology	Zoology
EVALUATOR'S FAMILIARITY WITH PROGRAM							
Considerable	99.9	99.9	99.5	100.0	100.0	100.0	100.0
Some	95.3	95.3	94.8	94.4	95.5	95.1	96.7
Little or None	10.3	14.3	8.5	10.7	8.6	6.5	12.8
TYPE OF SURVEY FORM							
Names	53.1	56.0	51.4	56.1	51.8	47.0	56.1
No Names	52.2	52.0	52.0	48.0	48.1	43.2	68.2
INSTITUTION OF HIGHEST DEGREE							
Alumni	91.6	96.0	84.0	94.1	91.4	95.1	96.4
Nonalumni	52.6	55.3	50.9	55.2	51.2	46.5	57.0
EVALUATOR'S PROXIMITY TO PROGRAM							
Same Region	64.4	66.1	63.3	64.1	64.0	56.7	75.3
Outside Region	51.4	54.1	50.0	54.3	49.6	45.3	55.3

NOTE: The item response rate is the percentage of the total ratings requested from survey participants that included a response other than "don't know."

of the sample members, randomly selected, were given forms without faculty names or doctoral data, as a "control group." Although one might expect that those given faculty names would have been more likely than other survey respondents to provide evaluations of the scholarly quality of program faculty, no appreciable differences were found (see Table 9.11) between the two groups in their frequency of response to this survey item. (The reader may recall that the provision of faculty names apparently had a positive effect on survey sample members' willingness to complete and return their questionnaires.[11])

The mean ratings provided by the group furnished faculty names are generally lower than the mean ratings supplied by other respondents (Table 9.12). Although the differences are small, they attract attention because they are reasonably consistent from discipline to discipline (except in physiology and zoology) and because the direction of the differences was not anticipated. After all, those programs more familiar to evaluators tended to receive higher ratings, yet when steps were taken to enhance the evaluator's familiarity, the resulting ratings are somewhat lower. One *post hoc* interpretation of this finding

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[11] As shown in Table 2.3, the survey response rate for those furnished faculty names is approximately 7 percentage points higher than that for those not given this information.

TABLE 9.12 Mean Ratings of Scholarly Quality of Program Faculty, by Type of Survey Form Provided to Evaluator

	MEAN RATINGS		CORRELATION	
	Names	No Names	r	N
Biochemistry	2.63	2.83	.76	137
Botany	3.01	3.19	.75	83
Cellular/Molecular Biology	2.94	3.33	.80	79
Microbiology	2.84	3.14	.57	126
Physiology	3.06	2.86	.52	84
Zoology	2.72	2.71	.88	70

NOTE: N reported in last column represents the number of programs with a rating from at least one evaluator in each of the two groups.

is that a program may be considered to have distinguished faculty if even only a few of its members are considered by the evaluator to be outstanding in their field. However, when a full list of program faculty is provided, the evaluator may be influenced by the number of individuals whom he or she could not consider to be distinguished. Thus, the presentation of these additional, unfamiliar names may occasionally result in a lower rating of program faculty.

However interesting these effects may be, one should not lose sight of the fact that they are small at best and that their existence does not necessarily imply that a program's relative standing on measure 08 would differ much whichever type of survey form was used. Since only about 1 in 10 ratings was supplied without the benefit of faculty names, it is hard to establish any very stable picture of relative mean ratings of individual programs. However, the correlations between the mean ratings supplied by the two groups are reasonably high--.75 or greater in four disciplines and .57 and .52 in microbiology and physiology, respectively (see Table 9.12). Were these coefficients adjusted for the fact that the group furnished forms without names constituted only about 10 percent of the survey respondents they would be substantially larger. From this result it seems reasonable to conclude that differences in the alternative survey forms used are not likely to be responsible for any large-scale reshuffling in the reputational ranking of programs on measure 08. It also suggests that the inclusion of faculty names in the committee's assessment need not prevent comparisons of the results with those obtained from the Roose-Andersen survey.

Another factor that might be thought to influence an evaluator's judgment about a particular program is the geographic proximity of that program to the evaluator. There is enough regional traffic in academic life that one might expect proximate programs to be better known than

TABLE 9.13 Mean Ratings of Scholarly Quality of Program Faculty, by Evaluator's Proximity to Region of Program

	MEAN RATINGS		CORRELATION	
	Nearby	Outside	r	N
Biochemistry	2.71	2.63	.92	134
Botany	2.99	3.03	.88	80
Cellular/Molecular Biology	2.91	2.91	.84	83
Microbiology	2.89	2.84	.87	131
Physiology	2.99	2.97	.76	97
Zoology	2.80	2.73	.86	68

NOTE: N reported in last column represents the number of programs with a rating from at least one evaluator in each of the two groups.

those in distant regions of the country. This hypothesis may apply especially to the smaller and less visible programs and is confirmed by the survey results. For purposes of analysis, programs were assigned to one of nine geographic regions[12] in the United States, and ratings of programs within an evaluator's own region are categorized in Table 9.13 as "nearby." Ratings of programs in any of the other eight regions were put in the "outside" group. Findings reported elsewhere in this chapter confirm that evaluators were more likely to provide ratings if a program was within their own region of the country,[13] and it is reasonable to imagine that the smaller and the less visible programs received a disproportionate share of their ratings either from evaluators within their own region or from others who for one reason or another were particularly familiar with programs in that region.

Although the data in Table 9.13 show that "nearby" programs were given higher ratings than those outside the evaluator's region in four of the disciplines, the differences in reported means are quite small and probably represent no more than a secondary effect that might be expected, because, as we have already seen, evaluators tended to rate higher those programs with which they were more familiar. Furthermore, the reasonably high correlations found between the mean ratings of the two groups indicate that the relative standings of programs are not dramatically influenced by the geographic proximity of those evaluating them.

Another consideration that troubles some critics is that large programs may be unfairly favored in a faculty survey because they are

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[12] See Appendix I for a list of the states included in each region.
[13] See Table 9.11.

TABLE 9.14 Mean Ratings of Scholarly Quality of Program Faculty, by Evaluator's Institution of Highest Degree

	MEAN RATINGS		NUMBER OF PROGRAMS WITH ALUMNI RATINGS
	Alumni	Nonalumni	N
Biochemistry	3.80	3.60	31
Botany	3.76	3.43	46
Cellular/Molecular Biology	3.69	3.46	35
Microbiology	3.36	3.11	51
Physiology	3.82	3.30	29
Zoology	3.56	3.32	30

NOTE: The pairs of means reported in each discipline are computed for a subset of programs with a rating from at least one alumnus and are substantially greater than the mean ratings for the full set of programs in each discipline.

likely to have more alumni contributing to their ratings who, it would stand to reason, would be generous in the evaluations of their alma maters. Information collected in the survey on each evaluator's institution of highest degree enables us to investigate this concern. The findings presented in Table 9.14 support the hypothesis that alumni provided generous ratings--with differences in the mean ratings (for measure 08) of alumni and nonalumni ranging from .20 to .52 in the six disciplines. Given the appreciable differences between the ratings furnished by program alumni and other evaluators, one might ask how much effect this has had on the overall results of the survey. The answer is "very little." As shown in the table, in biochemistry only one program in every four received ratings from any alumnus; in botany slightly more than half of the programs were evaluated by one or more alumni.[14] Even in the latter discipline, however, the fraction of alumni providing ratings of a program is always quite small and should have had minimal impact on the overall mean rating of any program. To be certain that this was the case, mean ratings of the scholarly quality of faculty were recalculated for every biological science program--with the evaluations provided by alumni excluded. The results were compared with the mean scores based on a full set of evaluations. Out of the 616 biological science programs evaluated in the survey, only 1 program (in physiology) had an observed difference as large as 0.2, and for 574 programs (93 percent) their mean ratings remain unchanged (to the nearest tenth of a unit). On the basis of these findings the committee saw no reason to exclude alumni ratings in the calculation of program means.

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[14] Because of the small number of alumni ratings in every discipline, the mean ratings for this group are unstable and therefore the correlations between alumni and nonalumni mean ratings are not reported.

Another concern that some critics have is that a survey evaluation may be affected by the interaction of the research interests of the evaluator and the area(s) of focus of the research-doctorate program to be rated. It is said, for example, that some narrowly focused programs may be strong in a particular area of research but that this strength may not be recognized by a large fraction of evaluators who happen to be unknowledgeable in this area. This is a concern more difficult to address than those discussed in the preceding pages since little or no information is available about the areas of focus of the programs being evaluated (although in certain disciplines the title of a department or academic unit may provide a clue). To obtain a better understanding of the extent to which an evaluator's field of specialty may have influenced the ratings he or she has provided, an analysis was made of ratings provided by evaluators in physics and statistics/biostatistics. In each discipline the survey participants were divided into two groups according to specialty field (as reported on the survey questionnaire). The results of the analysis, which are presented in the mathematical and physical sciences volume of the committee's report, indicate that there is a high degree of correlation in the mean ratings provided by those in differing specialty fields within these two disciplines. Although one cannot conclude from these findings that an evaluator's specialty field has no bearing on how he or she rates a program, these findings do suggest that the relative standings of programs in physics and statistics/biostatistics would not be greatly altered if the ratings by either group were discarded.

In the biological science disciplines there is a corollary concern that a survey evaluator may be influenced by the interaction of the university setting in which the evaluator works and the setting in which the program to be evaluated resides. For example, one might suspect that medical school faculty members would tend to rate research-doctorate programs in schools of medicine higher than would evaluators from other university settings. To test this hypothesis evaluators in each of the four biomedical disciplines--biochemistry, cellular/molecular biology, microbiology, and physiology--were separated into two groups: (1) those included on the faculties of programs located in medical schools and (2) those in other programs. For purposes of analysis, if a program spans both the medical and nonmedical school settings, the survey evaluators selected from that program have been included in the first group. The percentage of evaluators from medical school programs varies considerably by disciplines: biochemistry (60 percent), cellular/molecular biology (32 percent), microbiology (46 percent), and physiology (68 percent). As shown in Table 9.15, there is a high degree of correlation between the mean ratings provided by medical school and other faculty members. For the four biomedical disciplines the coefficients range from .83 to .96, suggesting that the relative standings of programs in each discipline would not be greatly affected if the survey responses of one of these two groups were ignored.

TABLE 9.15 Mean Ratings of Scholarly Quality of Program Faculty, by School in Which Evaluator's Own Program Is Located

	MEAN RATINGS		CORRELATION	
	Medical School	Other	r	N
Biochemistry	2.61	2.67	.96	138
Cellular/Molecular Biology	2.80	2.91	.94	88
Microbiology	2.89	2.77	.93	134
Physiology	2.87	3.01	.83	101

NOTE: N reported in last column represents the number of programs with a rating from at least one evaluator in each of the two groups.

INTERPRETATION OF REPUTATIONAL SURVEY RATINGS

It is not hard to foresee that results from this survey will receive considerable attention through enthusiastic and uncritical reporting in some quarters and sharp castigation in others. The study committee understands the grounds for both sides of this polarized response but finds that both tend to be excessive. It is important to make clear how we view these ratings as fitting into the larger study of which they are a part.

The reputational results are likely to receive a disproportionate degree of attention for several reasons, including the fact that they reflect the opinions of a large group of faculty colleagues and that they form a bridge with earlier studies of graduate programs. But the results will also receive emphasis because they alone, among all of the measures, seem to address quality in an overall or global fashion. While most recognize that "objective" program characteristics (i.e., publication productivity, research funding, or library size) have some bearing on program quality, probably no one would contend that a single one of these measures encompasses all that need be known about the quality of research-doctorate programs. Each is obviously no more than an indicator of some aspect of program quality. In contrast, the reputational ratings are global from the start because the respondents are asked to take into account many objective characteristics and to arrive at a general assessment of the quality of the faculty and the effectiveness of the program. This generality has self-evident appeal.

On the other hand, it is wise to keep in mind that these reputational ratings are measures of perceived program quality rather than of "quality" in some ideal or absolute sense. What this means is that, just as for all of the more objective measures, the reputational ratings represent only a partial view of what most of us would consider quality to be; hence, they must be kept in careful perspective.

Some critics may argue that such ratings are positively misleading because of a variety of methodological artifacts or because they are supplied by "judges" who often know very little about the programs they are rating. The committee has conducted the survey in a way that permits the empirical examination of a number of the alleged artifacts and, although our analysis is by no means exhaustive, the general conclusion is that their effects are slight.

Among the criticisms of reputational ratings from prior studies are some that represent a perspective that may be misguided. This perspective assumes that one asks for ratings in order to find out what "quality" really is and that to the degree that the ratings miss the mark of "quintessential quality," they are unreal, although the quality that they attempt to measure is real. What this perspective misses is the reality of quality and the fact that impressions of quality, if widely shared, have an imposing reality of their own and therefore are worth knowing about in their own right. After all, these perceptions govern a large-scale system of traffic around the nation's graduate institutions--for example, when undergraduate students seek the advice of professors concerning graduate programs that they might attend. It is possible that some professors put in this position disqualify themselves on grounds that they are not well informed about the relative merits of the programs being considered. Most faculty members, however, surely attempt to be helpful on the basis of impressions gleaned from their professional experience, and these assessments are likely to have major impact on student decision-making. In short, the impressions are real and have very real effects not only on students shopping for graduate schools but also on other flows, such as job-seeking young faculty and the distribution of research resources. At the very least, the survey results provide a snapshot of these impressions from discipline to discipline. Although these impressions may be far from ideally informed, they certainly show a strong degree of consensus within each discipline, and it seems safe to assume that they are more than passingly related to what a majority of keen observers might agree program quality is all about.

COMPARISON WITH RESULTS OF THE ROOSE-ANDERSEN STUDY

An analysis of the response to the committee's survey would not be complete without comparing the results with those obtained in the survey by Roose and Andersen 12 years earlier. Although there are obvious similarities in the two surveys, there are also some important differences that should be kept in mind in examining individual program ratings of the scholarly quality of faculty. Already mentioned in this chapter is the inclusion, on the form sent to 90 percent of the sample members in the committee's survey, of the names and academic ranks of faculty and the numbers of doctoral graduates in the previous five years. Other significant changes in the committee's form are the identification of the university department or academic unit in which each program may be found, the restriction of requesting evaluators to make judgments about no more than 50 research-doctorate programs in their discipline, and the presentation of these programs in random sequence on each survey form. The sampling frames used in the two surveys also differ. The sample selected in the earlier study included only individuals who had been nominated by the participating universities, while more than one-fourth of the sample in the committee's survey were chosen at random from full faculty lists. (Except for this difference the samples were quite similar--i.e., in terms of the number of evaluators in each discipline and the fraction of senior scholars.[15])

Several dissimilarities in the coverage of the Roose-Andersen study and this committee's reputational assessments should be mentioned. The former included a total of 130 institutions that had awarded at least 100 doctoral degrees in two or more disciplines during the FY1958-67 period. The institutional coverage in the committee's assessment was based on the number of doctorates awarded in each discipline (as described in Chapter I) and covered a total population of 228 universities. Most of the universities represented in the present study but not the earlier one are institutions that offered research-doctorate programs in a limited set of disciplines. In the Roose-Andersen study, programs in 10 biological science disciplines were rated: biochemistry, botany, developmental biology, entomology, microbiology, molecular biology, pharmacology, physiology, population biology, and zoology. For reasons explained in Chapter I, the committee in its assessment was able to include programs in the six disiplines with the largest numbers of doctoral awards in recent years.[16] Programs in the other four disciplines--developmental biology, entomology, pharmacology, and population biology--were not evaluated in the present assessment. Finally, in the Roose-Andersen study only one set of ratings was compiled from each institution represented in a discipline, whereas in the committee's survey separate ratings were requested if a university offered more than one research-doctorate program in a given discipline. In the committee's survey, evaluations were requested for a total of 616 research-doctorate programs in the six biological science disciplines, compared with 618 programs in these same disciplines in the Roose-Andersen study. Although the total numbers of programs included in the studies are nearly equal, there are many differences in the program coverage in each discipline.

Figures 9.1-9.6 plot the mean ratings of scholarly quality of faculty in programs included in both surveys; sets of ratings are graphed for 90 programs in biochemistry, 52 programs in botany, 53 programs in cellular/molecular biology, 82 programs in microbiology, 63 programs in physiology, and 48 programs in zoology. Since in the Roose-Andersen

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[15] For a description of the sample group used in the earlier study, see Roose and Andersen, pp. 28-31.

[16] It should be noted that the "molecular biology" category used in the Roose-Andersen study was expanded in the committee's assessment to include cellular and molecular biology programs.

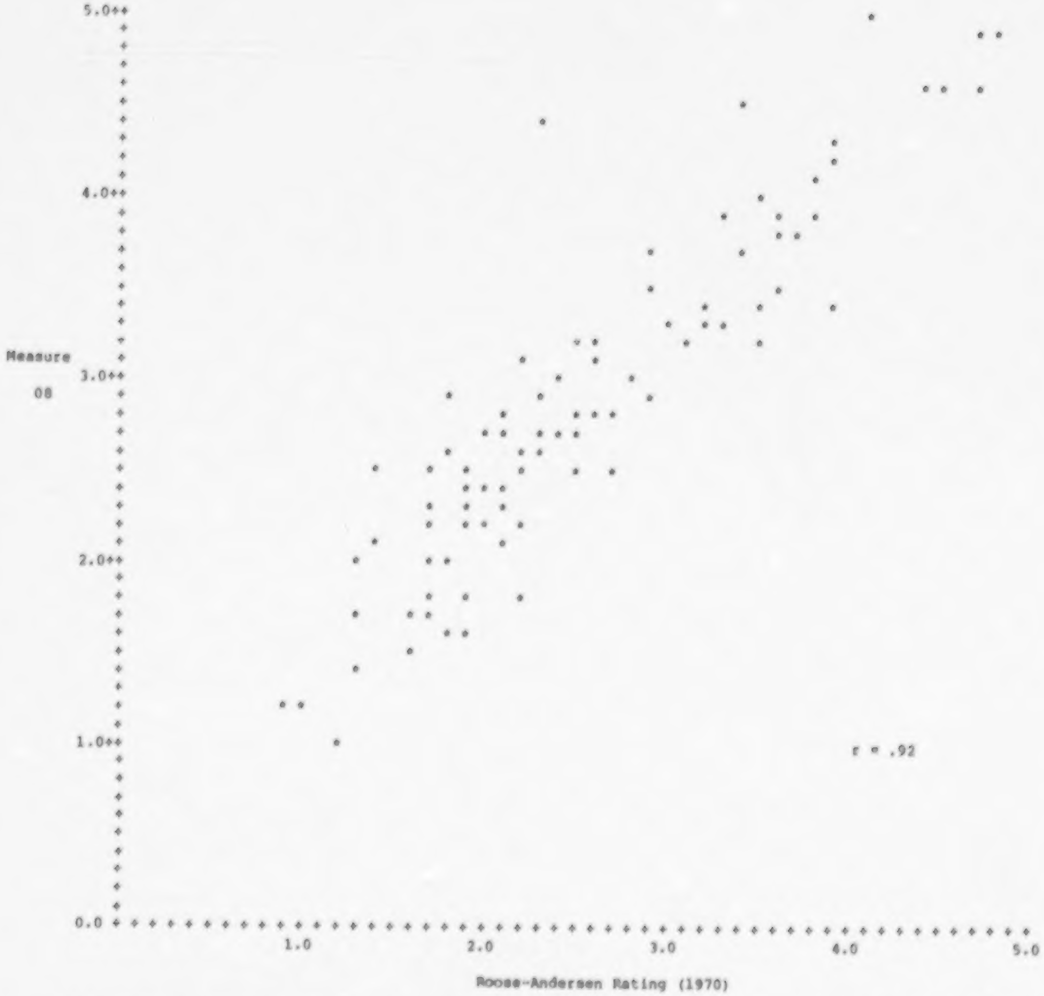

FIGURE 9.1 Mean rating of scholarly quality of faculty (measure 08) versus mean rating of faculty in the Roose-Andersen study--90 programs in biochemistry.

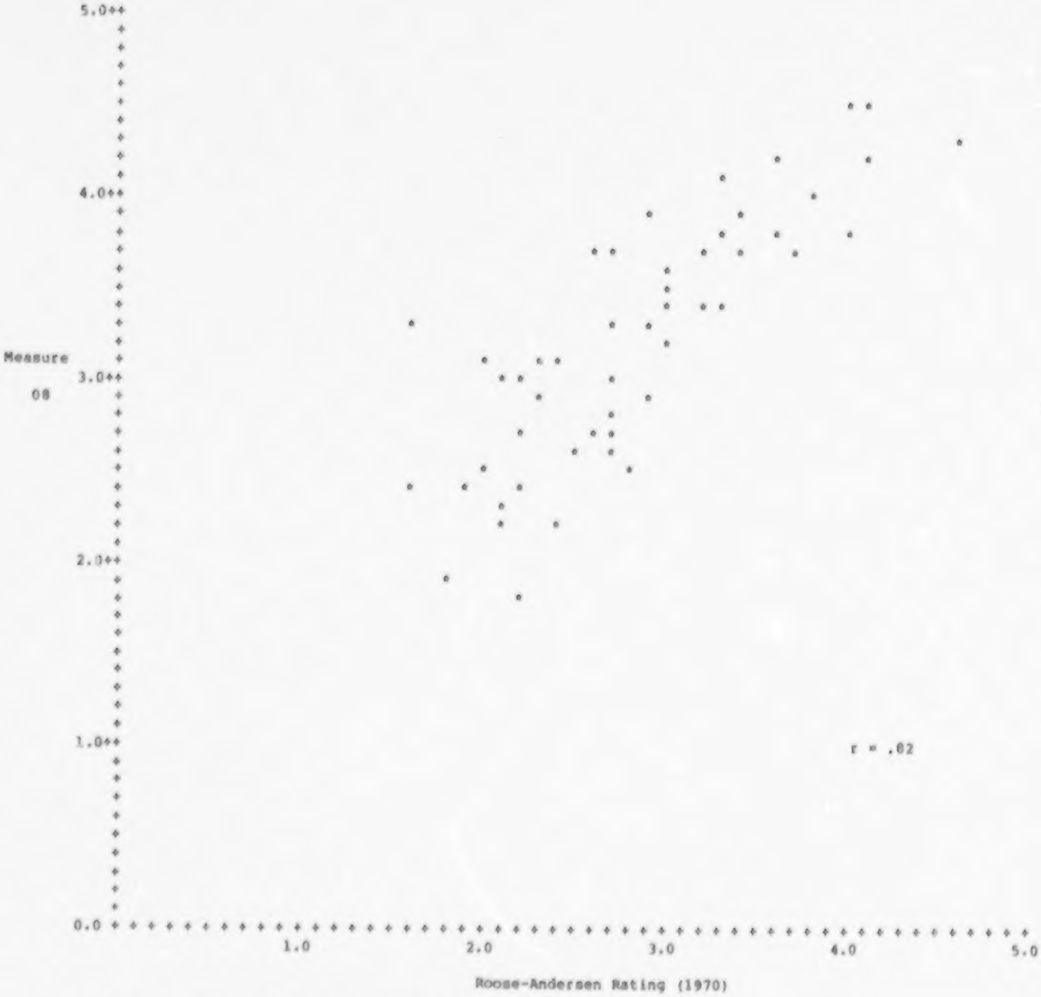

FIGURE 9.2 Mean rating of scholarly quality of faculty (measure 08) versus mean rating of faculty in the Roose-Andersen study--53 programs in botany.

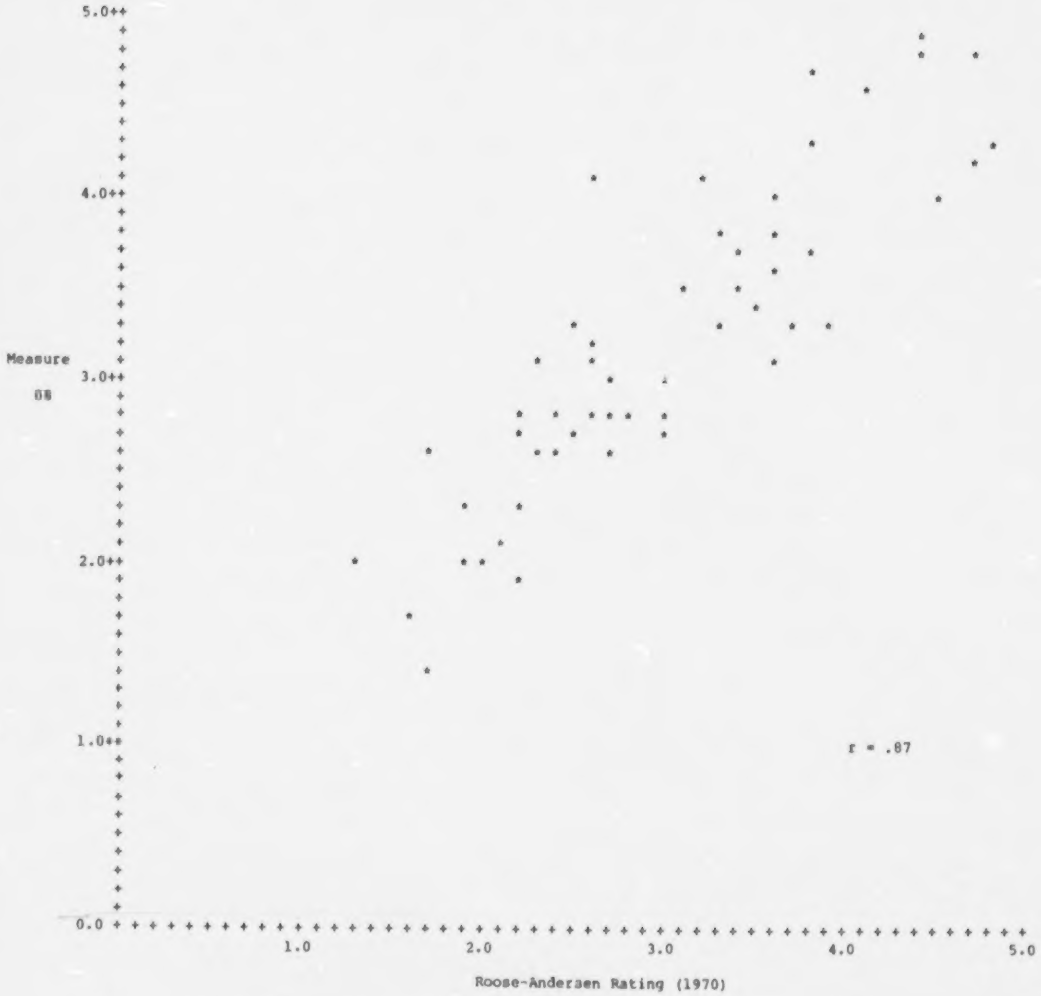

FIGURE 9.3 Mean rating of scholarly quality of faculty (measure 08) versus mean rating of faculty in the Roose-Andersen study--53 programs in cellular/molecular biology.

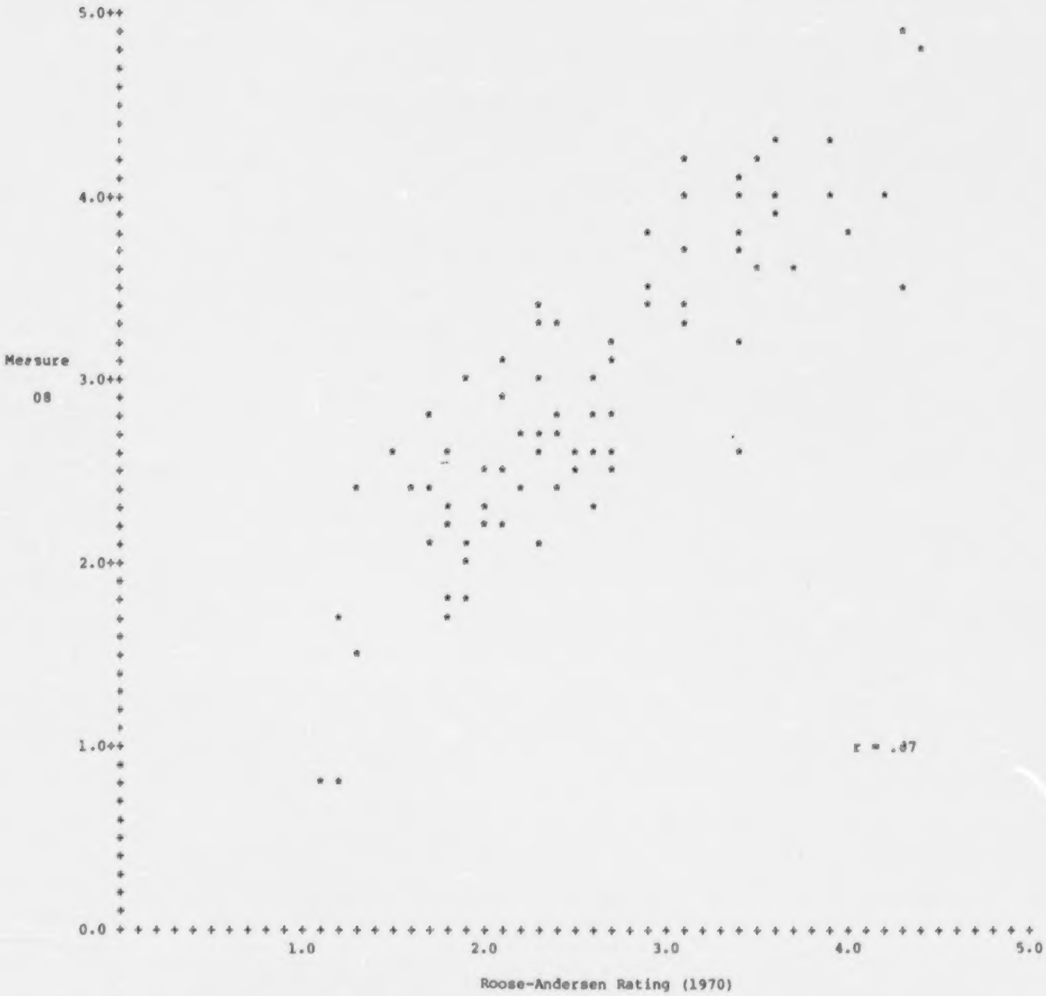

FIGURE 9.4 Mean rating of scholarly quality of faculty (measure 08) versus mean rating of faculty in the Roose-Andersen study--82 programs in microbiology.

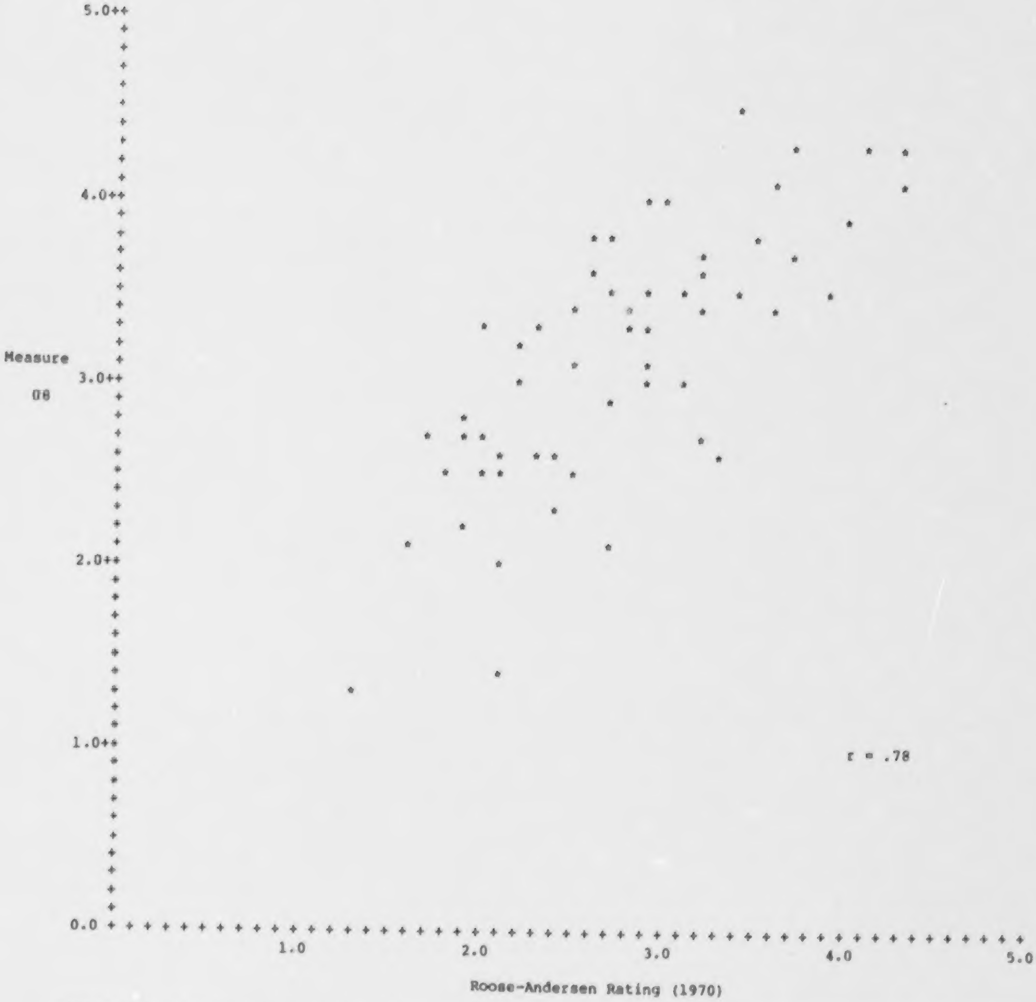

FIGURE 9.5 Mean rating of scholarly quality of faculty (measure 08) versus mean rating of faculty in the Roose-Andersen study--63 programs in physiology.

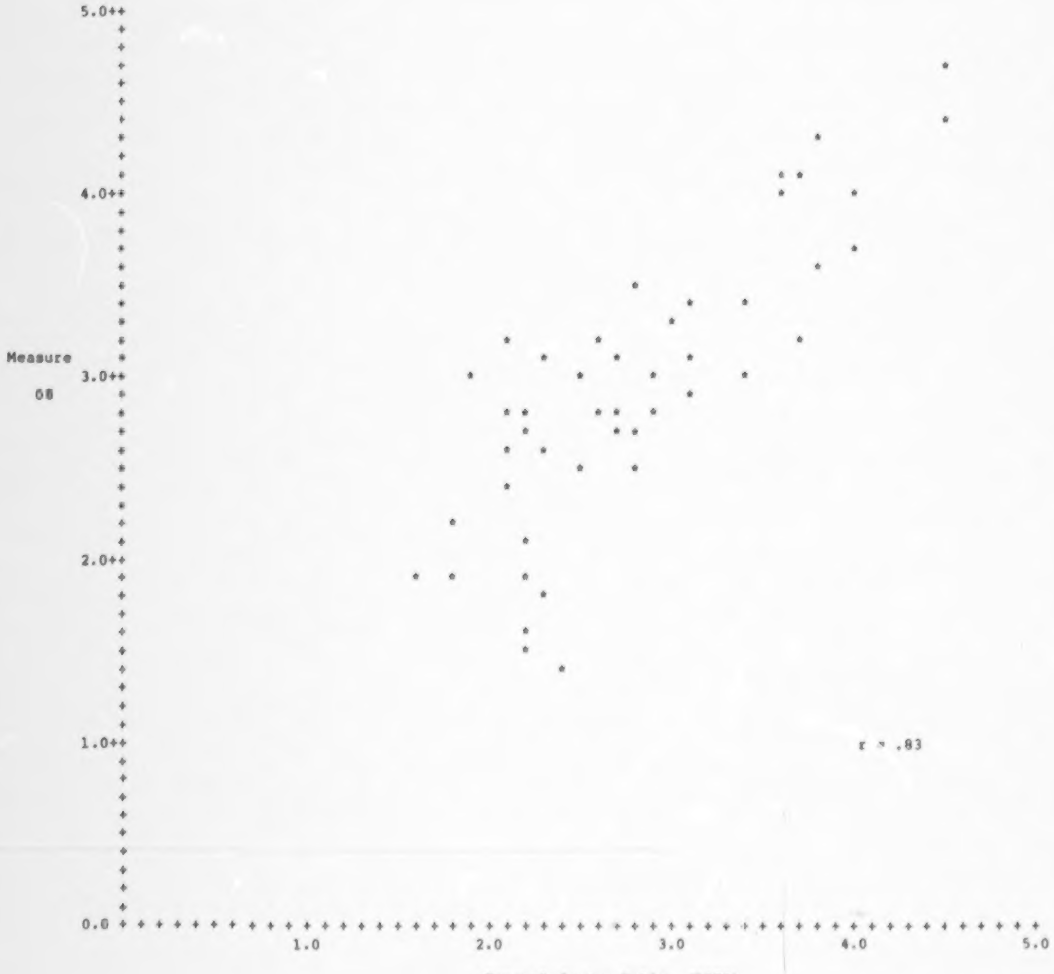

FIGURE 9.6 Mean rating of scholarly quality of faculty (measure 08) versus mean rating of faculty in the Roose-Andersen study--48 programs in zoology.

study programs were identified by institution and discipline (but not by department), the matching of results from this survey with those from the committee's survey is not precise. For universities represented in the latter survey by more than one program in a particular discipline, the mean rating for the program with the largest number of graduates (measure 02) is the only one plotted here. Although the results of both surveys are reported on identical scales, some caution must be taken in interpreting differences in mean ratings a program received in the two evaluations. It is impossible to estimate what effect all of the differences described above may have had on the results of the two surveys. Furthermore, one must remember that the reported scores are based on the opinions of different groups of faculty members and were provided at different time periods. In 1969, when the Roose-Andersen survey was conducted, graduate departments in most universities were still expanding and not facing the enrollment and budget reductions that many departments have had to deal with in recent years. Consequently, a comparison of the overall findings from the two surveys tells us nothing about how much graduate education has improved (or declined) in the past decade. Nor should the reader place much stock in any small differences in the mean ratings that a particular program may have received in the two surveys. On the other hand, it is of particular interest to note the high correlations between the results of the evaluations. For programs in biochemistry, cellular/molecular biology, and microbiology, the correlation coefficients range between .87 and .92; in botany, physiology, and zoology, the coefficients range between .78 and .83. The high correlations found here may suggest to some readers that reputational standings of programs in these disciplines have changed very little in the last decade. However, differences are apparent for some institutions. Also, one must keep in mind that the correlations are based on the reputational ratings of only approximately two-thirds of the programs evaluated in this assessment in these disciplines and do not take into account the emergence of many new programs that did not exist or were too small to be rated in the Roose-Andersen study.

FUTURE STUDIES

One of the most important objectives in undertaking this assessment was to test new measures not used extensively in past evaluations of graduate programs. Although the committee believes that it has been successful in this effort, much more needs to be done. First and foremost, studies of this kind should be extended to cover other types of programs and other disciplines not included in this effort. As a consequence of budgeting limitations, the committee had to restrict its study to 32 disciplines, selected on the basis of the number of doctorates awarded in each. Among those omitted were programs in developmental biology, entomology, pharmacology, and population biology, all of which were included in the Roose-Andersen study; a multidimensional assessment of research-doctorate programs in these and many other important disciplines would be of value. Consideration should also be given to embarking on evaluations of programs offering other types of graduate and professional degrees. As a matter of fact, plans for including master's-degree programs in this assessment were originally contemplated, but because of a lack of available information about the resources and graduates of programs at the master's level, it was decided to focus on programs leading to the research doctorate.

Perhaps the most debated issue the committee has had to address concerned which measures should be reported in this assessment. In fact, there is still disagreement among some of its members about the relative merits of certain measures, and the committee fully recognizes a need for more reliable and valid indices of the quality of graduate programs. First on a list of needs is more precise and meaningful information about the product of research-doctorate programs--the graduates. For example, what fraction of the program graduates have gone on to be productive investigators--either in the academic setting or in government and industrial laboratories? What fraction have gone on to become outstanding investigators--as measured by receipt of major prizes, membership in academies, and other such distinctions? How do program graduates compare with regard to their publication records? Also desired might be measures of the quality of the students applying for admittance to a graduate program (e.g., Graduate Record Examination scores, undergraduate grade point averages). If reliable data of this sort were made available, they might provide a useful index of the reputational standings of programs, from the perspective of graduate students.

A number of alternative measures relevant to the quality of program faculty were considered by the committee but not included in the assessment because of the associated difficulties and costs of compiling the necessary data. For example, what fraction of the program faculty were invited to present papers at national meetings? What fraction had been elected to prestigious organizations/groups in their field? What fraction had received senior fellowships and other awards of distinction? In addition, it would be highly desirable to supplement the data presented on NSF, NIH, and ADAMHA research grant awards (measure 13) with data on awards from other federal agencies (e.g., Department of Agriculture, Department of Defense, Department of Energy, National Aeronautics and Space Administration) as well as from major private foundations.

As described in the preceding pages, the committee was able to make several changes in the survey design and procedures, but further improvements could be made. Of highest priority in this regard is the expansion of the survey sample to include evaluators from outside the academic setting (in particular, those in government and industrial laboratories who regularly employ graduates of the programs to be evaluated). To add evaluators from these sectors would require a major effort in identifying the survey population from which a sample could be selected. Although such an effort is likely to involve considerable costs in both time and financial resources, the committee believes that the addition of evaluators from the government and industrial settings would be of value in providing a different perspective to the reputational assessment and that comparisons between the ratings supplied by academic and nonacademic evaluators would be of particular interest.

Minority Statement

The inclusion of several different and independent possible measures reflecting the quality of graduate education in this report seems to us a substantial addition and a significant improvement to previous such studies. However, we are concerned with the possibility that there are perhaps too many measures, some of which have little or no bearing on the objectives of the present study. In particular, measures 06 and 07 (on the employment plans of graduates) are not informative, have little or nothing to do with the quality of the program, and yield numbers that are not very dependable. Both measures come from data in the NRC's Survey of Earned Doctorates. Measure 06, the fraction of FY1975-79 program graduates with definite employment or study plans at time of doctorate, is vague because the "time of doctorate" may vary considerably from the time of year when, say, academic appointments are offered--and this in turn can vary substantially among institutions. This measure may be associated with the prosperity of the program, but its connection with quality is tenuous. Measure 07, the fraction of FY1975-79 program graduates planning to take positions in Ph.D.-granting universities, is even more nebulous. What is meant by "planning"? How firm are those plans? (We can't know; all there is is a check somewhere on a questionnaire.) What about the variation in quality among different Ph.D.-granting universities. It can be considerable, and such considerable differences are precisely those the whole study is attempting to measure. Such data obscure the differences. Further, measure 07 betrays the inherent bias of the present study and previous ones in that the "program graduates planning to take positions in Ph.D.-granting universities" is tacitly offered as a measure of the "goodness" of the program. In the late 1970's and 1980's nothing can be farther from the truth. The kindest evaluation of measures 06 and 07 is that they are irrelevant.

These two measures do not result from careful plans made by the committee for this study in order to find other useful new measures. Such plans were considered, but for various good reasons could not be carried out. These two particular measures just happen to be available in the vast data collected and recorded (but not critically evaluated) over the years by the Commission on Human Resources of the National Research Council. Their inclusion in this report might be explained by bureaucratic inertia, but this inclusion adds nothing to the report.

SAUNDERS MAC LANE

C. K. N. PATEL

ERNEST S. KUH

Appendixes

APPENDIX A

LETTER TO INSTITUTIONAL COORDINATORS

COMMITTEE ON AN ASSESSMENT OF QUALITY-RELATED CHARACTERISTICS
OF RESEARCH-DOCTORATE PROGRAMS IN THE UNITED STATES

Established by the Conference Board of Associated Research Councils

Office of the Staff Director / National Research Council / 2101 Constitution Avenue, N.W. / Washington, D.C. 20418

(202) 389-6552

December 5, 1980

Dear

We are pleased to learn that you have been designated to coordinate the efforts of your institution in assisting our committee with an assessment of the characteristics and effectiveness of research-doctorate programs in U.S. universities. A prospectus describing the goals and procedures for this study has already been distributed to university presidents and graduate deans. The cooperation of universities and their faculties is essential for the assessment to be carried out in an objective and accurate fashion.

The study is being conducted under the aegis of the Conference Board of Associated Research Councils and is housed administratively within the National Research Council. Financial support has been provided by the Andrew W. Mellon Foundation, the Ford Foundation, the National Science Foundation, and the National Institutes of Health. The study will examine more than 2,600 programs in 31 fields in the physical sciences, engineering, life sciences, social sciences, and humanities. Approximately 10,000 faculty members will be asked to evaluate programs in their own fields. In addition to the reputational evaluations by faculty, information will be compiled from national data banks on the achievements of both the faculty involved in each program and the program graduates.

The product of this study will be a series of reports with descriptive data on institutional programs in each of 31 fields to be covered. These reports will present several different measures of the quality-related characteristics of each program being evaluated. Some of the measures will be adjusted for program size. With the cooperation of your institution and that of other universities, we plan to produce these reports by late spring of 1982. At that time the detailed data that have

COMMITTEE MEMBERS

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Ernest S. Kuh

Winfred P. Lehmann
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James C. Olson

Kumar Patel
Michael J. Pelczar, Jr.
Jerome B. Schneewind
Duane C. Spriestersbach
Harriet A. Zuckerman

been compiled on research-doctorate programs within your institution will be made available to you for a nominal cost. These data should prove to be quite valuable for an assessment of the particular strengths and weaknesses of individual programs at your institution.

For the past three months the committee has deliberated over what fields are to be covered in the study and which programs within each field are to be evaluated. The financial resources available limit us to an assessment of approximately 2,600 programs in 31 fields. The fields to be included have been determined on the basis of the total number of doctorates awarded by U.S. universities during the FY1976-78 period and the feasibility of identifying and evaluating comparable programs in a particular field. Within each of the 31 fields, programs which awarded more than a specified number of doctorates during the period have been designated for inclusion in the study.

For each of the programs at your institution that are to be evaluated, we ask that you furnish the names and ranks of all faculty members who participate significantly in education toward the research doctorate, along with some basic information (as indicated) about the program itself. A set of instructions and a computer-printed roster (organized by field) are enclosed. In addition, you are given an opportunity to nominate other programs at your institution that are not on the roster, but that you believe have significant distinction and should be included in our evaluation. Any program you nominate must belong in one of the 31 fields covered by the study.

The information supplied by your institution will be used for two purposes. First, a sample of the faculty members identified with each program will be selected to evaluate research-doctorate programs in their fields at other universities. The selection will be made in such a way as to ensure that all institutional programs and faculty ranks are adequately represented in each field category. Secondly, a list of names of faculty and some of the program information you supply will be provided to evaluators selected from other institutions. Thus, it is important that you provide accurate and up-to-date information. You may wish to ask department chairmen or other appropriate persons at your institution to assist in providing the information requested. If you do so, we ask that your office coordinate the effort by collecting the information on each program and sending a single package to us in the envelope provided.

We hope that you will be able to complete this request by December 15. Should you have any questions regarding our request, please call (collect) Porter Coggeshall, the study director, at (202)389-6552. Thank you for your help in this effort.

Sincerely,

Lyle V. Jones

Lyle V. Jones
Co-Chairman

Gardner Lindzey

Gardner Lindzey
Co-Chairman

INSTRUCTIONS

General Instructions

- Provided on the first page of the accompanying roster is a list of the 31 program fields to be covered in this study. Those program fields for which you are requested to furnish information have been designated with an asterisk (*).

- For every designated field there is a separate set of roster pages. Please provide all of the information requested on these pages.

- If your institution offers more than one research-doctorate program in a designated field, we ask that you copy the roster pages furnished for that field category and provide a separate set of information for each program. For example, if your university offers one doctoral program in statistics and another in biostatistics, these should be listed separately. For this purpose, programs offered by different departments (or other administative units) that are advertised as distinct programs in your catalogues would be listed separately. Do not consider different specialty areas within a department to be separate programs.

- If your institution currently does not offer a research-doctorate program in an asterisked field or if, in your judgment, a doctoral program offered fails to fit the designated field category, please so indicate on the roster pages provided for that field.

List of Faculty Members (as of December 1, 1980)

- On each program roster please provide the names of faculty members who participate significantly in doctoral education.

- Included should be individuals who (a) are members of the regular academic faculty (typically holding the rank of assistant, associate, or full professor) and (b) regularly teach doctoral students and/or serve on doctoral committees.

- Members of the faculty who are currently on leave of absence but meet the above criteria should be included.

- Visiting faculty members should not be included.

- Emeritus or adjunct faculty members (or faculty with other comparable ranks) should also be excluded unless they currently participate significantly in doctoral education.

- Members of the faculty who participate significantly in doctoral education in more than one program should be listed on the roster for each program in which they participate.

- In many instances the list of faculty for a program may be identical to an institutional list of graduate faculty.

- Faculty names should be provided in the form in which they are most likely to be recognized by colleagues in the field. We prefer that, within each academic rank, you list faculty alphabetically by last name.

Nomination of Faculty to Serve as Program Evaluators
(Column 3 of Faculty Roster)

- Please check the names of at least two faculty members in each academic rank within each program who would be available and, in your opinion, well-qualified to evaluate research-doctorate programs in their field.

- A sample of evaluators will be selected from the list of faculty you provide for each program. In selecting evaluators preference will be given to those whose names you have checked. If no names are checked, a random sample will be selected from the faculty list.

Faculty Who Do Not Hold Ph.D. Degrees From U.S. Universities
(Column 4 of Faculty Roster)

- In order to help us match the faculty names you provide with records in the Doctorate Records File (maintained by the National Research Council), we ask that you identify those faculty members who do not hold a Ph.D. or equivalent research-doctorate from a university in the United States.

- This information will be used only for the purposes of collating records and will not be released to those who are selected to evaluate your institution's programs. Nor will this information affect in any way the selection of program evaluators from your institution's faculty.

Nomination of Additional Programs

- We recognize the possibility that we may have omitted one or more research-doctorate programs at your institution that belong to (non-asterisked) fields listed on the first page of the roster and that you believe should be included in this study.

- The last two pages of the accompanying roster are provided for the nomination of an additional program. You are asked to provide the names of faculty and other information about each program you nominate. Should you decide to nominate more than one program, it will be necessary to make additional copies of these two pages of the roster.

- Please restrict your nominations to programs in your institution that you consider to be of uncommon distinction and that have awarded no fewer than two doctorates during the past two years.

- Only programs which fall under one of the 31 field categories listed on the first page of the accompanying roster will be considered for inclusion in the study.

PLEASE RETURN COMPLETED ROSTER IN
THE ENCLOSED ENVELOPE TO:

COMMITTEE ON AN ASSESSMENT OF
QUALITY-RELATED CHARACTERISTICS
OF RESEARCH-DOCTORATE PROGRAMS
NATIONAL RESEARCH COUNCIL, JH-711
2101 CONSTITUTION AVENUE, N.W.
WASHINGTON, D.C. 20418

FIELDS INCLUDED IN THE STUDY

ARTS AND HUMANITIES

- * ART HISTORY
- * CLASSICS
- * ENGLISH LANGUAGE AND LITERATURE
- * FRENCH LANGUAGE AND LITERATURE
- * GERMAN LANGUAGE AND LITERATURE
- LINGUISTICS
- MUSIC
- * PHILOSOPHY
- * SPANISH AND PORTUGUESE LANGUAGE AND LITERATURE

BIOLOGICAL SCIENCES

- * BIOCHEMISTRY
- BOTANY (INCLUDING PLANT PHYSIOLOGY, PLANT PATHOLOGY, MYCOLOGY)
- * CELLULAR BIOLOGY/MOLECULAR BIOLOGY
- * MICROBIOLOGY (INCLUDING IMMUNOLOGY, BACTERIOLOGY, PARASITOLOGY, VIROLOGY)
- * PHYSIOLOGY (ANIMAL, HUMAN)
- ZOOLOGY

ENGINEERING

- * CHEMICAL ENGINEERING
- * CIVIL ENGINEERING
- * ELECTRICAL ENGINEERING
- * MECHANICAL ENGINEERING

PHYSICAL SCIENCES

- * CHEMISTRY
- * COMPUTER SCIENCES
- * GEOSCIENCES (INCLUDING GEOLOGY, GEOCHEMISTRY, GEOPHYSICS, GENL EARTH SCI)
- * MATHEMATICS
- * PHYSICS (EXCLUDING ASTRONOMY, ASTROPHYSICS)
- STATISTICS (INCLUDING BIOSTATISTICS)

SOCIAL AND BEHAVIORAL SCIENCES

- * ANTHROPOLOGY
- * ECONOMICS
- * HISTORY
- * POLITICAL SCIENCE
- * PSYCHOLOGY
- * SOCIOLOGY

* DESIGNATES FIELDS FOR WHICH YOU ARE REQUESTED TO PROVIDE INFORMATION ON RESEARCH-DOCTORATE PROGRAMS IN YOUR INSTITUTION. (SEE INSTRUCTION SHEET REGARDING NOMINATION OF ADDITIONAL PROGRAMS TO BE INCLUDED IN THE STUDY) .

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**************************************************
***                                  - PART A  ***
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PLEASE ANSWER EACH OF THE FOLLOWING QUESTIONS ABOUT THE RESEARCH-DOCTORATE PROGRAM

IN ______________________________

(1) WHAT IS THE NAME OF THE DEPARTMENT (OR EQUIVALENT ACADEMIC UNIT) IN WHICH THIS RESEARCH-DOCTORATE PROGRAM IS OFFERED ?

....

(2) HOW MANY PH.D.'S (OR EQUIVALENT RESEARCH-DOCTORATES) HAVE BEEN AWARDED IN THE PROGRAM IN EACH OF THE LAST FIVE ACADEMIC YEARS ?

1975-76 ....

1976-77 ....

1977-78 ....

1978-79 ....

1979-80 ....

(3) APPROXIMATELY HOW MANY FULL-TIME AND PART-TIME GRADUATE STUDENTS ENROLLED IN THE PROGRAM AT THE PRESENT TIME (FALL 1980) INTEND TO EARN DOCTORATES ?

FULL-TIME STUDENTS ....

PART-TIME STUDENTS ....

TOTAL ....

(4) IN APPROXIMATELY WHAT YEAR WAS THIS RESEARCH-DOCTORATE PROGRAM INITIATED ? (IF PROGRAM WAS DISCONTINUED AND SUBSEQUENTLY REINSTATED, PLEASE GIVE YEAR IT WAS REINSTATED) .

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*** _                                - PART B ***
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(1) LIST BELOW <u>ALL FACULTY WHO PARTICIPATE SIGNIFICANTLY IN DOCTORAL EDUCATION</u> IN THIS PROGRAM (SEE INSTRUCTIONS SHEET). PLEASE PRINT OR TYPE <u>NAMES</u> IN FOLLOWING FORMAT: EXAMPLE: MARY A. JONES A. B. SMITH, JR.	(2) INDICATE THE ACADEMIC RANK OF EACH FACULTY MEMBER (PROF., ASSOC. PROF., ASST. PROF., ETC.).	(3) CHECK BELOW AT LEAST 2 FACULTY IN <u>EACH</u> RANK AVAILABLE AND WELL-QUALIFIED TO EVALUATE OTHER PROGRAMS (SEE INSTRUCTIONS SHEET).	(4) CHECK BELOW ANY FACULTY WHO DO <u>NOT</u> HOLD A PH.D. OR OTHER RESEARCH-DOCTORATE FROM A <u>UNIVERSITY IN THE</u> U.S. (SEE INSTRUCTIONS SHEET).
01	..	( )	( )
02	..	( )	( )
03	..	( )	( )
04	..	( )	( )
05	..	( )	( )
06	..	( )	( )
07	..	( )	( )
08	..	( )	( )
09	..	( )	( )
10	..	( )	( )
11	..	( )	( )
12	..	( )	( )
13	..	( )	( )
14	..	( )	( )
15	..	( )	( )
16	..	( )	( )
17	..	( )	( )
18	..	( )	( )
19	..	( )	( )
20	..	( )	( )

(PART B CONTINUED ON NEXT PAGE)

APPENDIX B

SURVEY OF EARNED DOCTORATES

(Conducted by the National Research Council under the sponsorship of the National Science Foundation, the Department of Education, the National Institutes of Health, and the National Endowment for the Humanities.)

This annual survey of new recipients of Ph.D. or equivalent research doctorates in all fields of learning contains information describing their demographic characteristics, educational background, graduate training, and postgraduation plans. The source file includes nearly complete data from all 1958-81 doctorate recipients and partial information for all 1920-57 doctoral graduates.

NSF Form 558 1977
OMB No. 99-R0290
Approval Expires June 30, 1979

SURVEY OF EARNED DOCTORATES

This form is to be returned to the GRADUATE DEAN, for forwarding to .... Board on Human-Resource Data and Analyses
Commission on Human Resources
National Research Council
2101 Constitution Avenue, Washington, D. C. 20418

Please print or type.

A. Name in full: .... (9-30)
(Last Name) (First Name) (Middle Name)

Cross Reference: Maiden name or former name legally changed .... (31)

B. Permanent address through which you could always be reached: (Care of, if applicable) ....
(Number) (Street) (City)
(State) (Zip Code) (Or Country if not U.S.)

C. U.S. Social Security Number: _ _ _ - _ _ - _ _ _ _ (32-40)

D. Date of birth: .... Place of birth: ....
(41-45) (Month) (Day) (Year) (46-47) (State) (Or Country if not U.S.)

E. Sex: 1 ☐ Male 2 ☐ Female (48)

F. Marital status: 1 ☐ Married 2 ☐ Not married (including widowed, divorced) (49)

G. Citizenship: 0 ☐ U.S. native 2 ☐ Non U.S., Immigrant (Permanent Resident)
1 ☐ U.S. naturalized 3 ☐ Non-U.S., Non-Immigrant (Temporary Resident) (50)
If Non-U.S., indicate country of present citizenship .... (51-52)

H. Racial or ethnic group: (Check all that apply.) *A person having origins in —*
0 ☐ American Indian or Alaskan Native ..... any of the original peoples of North America, and who maintain cultural identification through tribal affiliation or community recognition.
1 ☐ Asian or Pacific Islander .... any of the original peoples of the Far East, Southeast Asia, the Indian Subcontinent, or the Pacific Islands. This area includes, for example, China, Japan, Korea, the Philippine Islands, and Samoa.
2 ☐ Black, not of Hispanic Origin .... any of the black racial groups of Africa.
3 ☐ White, not of Hispanic Origin .... any of the original peoples of Europe, North Africa, or the Middle East.
4 ☐ Hispanic .... Mexican, Puerto Rican, Central or South American, or other Spanish culture or origins, regardless of race. (53-55)

I. Number of dependents: Do not include yourself. (Dependent = someone receiving at least one half of his or her support from you) .... (56)

J. U.S. veteran status: 0 ☐ Veteran 1 ☐ On active duty 2 ☐ Non-veteran or not applicable (57)

EDUCATION

K. High school last attended: .... (58-59)
(School Name) (City) (State)

Year of graduation from high school: .... (60-61)

L. List in the table below all collegiate and graduate institutions you have attended including 2-year colleges. List chronologically, and include your doctoral institution as the last entry.

Institution Name	Location	Years Attended		Major Field		Minor Field	Degree (if any)		
				Use Specialties List			Title of Degree	Granted	
		From	To	Name	Number	Number		Mo.	Yr.

M. Enter below the title of your doctoral dissertation and the most appropriate classification number and field. If a project report or a musical or literary composition (not a dissertation) is a degree requirement, please check box. ☐ (44)

Title ....
Classify using Specialties List
Number Name of field
....

N. Name the department (or interdisciplinary committee, center, institute, etc.) and school or college of the university which supervised your doctoral program: ....
(Department/Institute/Committee/Program) (School)

O. Name of your dissertation adviser: ....
(Last Name) (First Name) (Middle Initial)

continued on next page

SURVEY OF EARNED DOCTORATES, Cont.

P. Please enter a "1" beside your primary source of support during graduate study. Enter a "2" beside your secondary source of support during graduate study. Check all other sources from which support was received.

58 ___ NSF Fellowship
59 ___ NSF Traineeship
60 ___ NIH Fellowship
61 ___ NIH Traineeship
62 ___ NDEA Fellowship
63 ___ Other HEW
64 ___ AEC/ERDA Fellowship
65 ___ NASA Traineeship
66 ___ GI Bill
67 ___ Other Federal support (specify) ....
68 ___ Woodrow Wilson Fellowship
69 ___ Other U.S. national fellowship (specify) ....
70 ___ University Fellowship
71 ___ Teaching Assistantship
72 ___ Research Assistantship
73 ___ Educational fund of industrial or business firm
74 ___ Other institutional funds (specify) ....
75 ___ Own earnings
76 ___ Spouse's earnings
77 ___ Family contributions
78 ___ Loans (NDSL direct)
79 ___ Other loans
80 ___ Other (specify) ....

Q. Please check the space which most fully describes your status during the year immediately preceding the doctorate.

0 ☐ Held fellowship
1 ☐ Held assistantship
2 ☐ Held own research grant
3 ☐ Not employed
4 ☐ Part-time employed

Full-time Employed in: (Other than 0, 1, 2)
5 ☐ College or university, teaching
6 ☐ College or university, non-teaching
7 ☐ Elem. or sec. school, teaching
8 ☐ Elem. or sec. school, non-teaching
9 ☐ Industry or business
(11) ☐ Other (specify) ....

(12) ☐ Any other (specify) .... (9)

R. How many years (full-time equivalent basis) of professional work experience did you have prior to the doctorate? (include assistantships as professional experience) .... (10-11)

POSTGRADUATION PLANS

S. How well defined are your postgraduation plans?
0 ☐ Have signed contract or made definite commitment
1 ☐ Am negotiating with a specific organization, or more than one
2 ☐ Am seeking appointment but have no specific prospects

3 ☐ Other (specify) .... (12)

T. What are your immediate postgraduation plans?
0 ☐ Postdoctoral fellowship?
1 ☐ Postdoctoral research associateship?
2 ☐ Traineeship?
3 ☐ Other study (specify) ....
Go to Item "U"
4 ☐ Employment (other than 0, 1, 2, 3)
5 ☐ Military service?
6 ☐ Other (specify) .... (13)
Go to Item "V"

U. If you plan to be on a postdoctoral fellowship, associateship, traineeship or other study

What will be the field of your postdoctoral study?
Classify using Specialties List.
Number Field

.... (14-16)

What will be the primary source of support?
0 ☐ U.S. Government
1 ☐ College or university
2 ☐ Private foundation
3 ☐ Nonprofit, other than private foundation
4 ☐ Other (specify)
.... (17)
6 ☐ Unknown
Go to Item "W"

V. If you plan to be employed, enter military service, or other — What will be the type of employer?
0 ☐ 4-year college or university other than medical school
1 ☐ Medical school
2 ☐ Jr. or community college
3 ☐ Elem. or sec. school
4 ☐ Foreign government
5 ☐ U.S. Federal government
6 ☐ U.S. state government
7 ☐ U.S. local government
8 ☐ Nonprofit organization
9 ☐ Industry or business
(11) ☐ Self-employed
(12) ☐ Other (specify) .... (18)

Indicate *primary* work activity with "1" in appropriate box; *secondary* work activity (if any) with "2" in appropriate box.
0 ☐ Research and development
1 ☐ Teaching
2 ☐ Administration
3 ☐ Professional services to individuals
5 ☐ Other (specify) .... (19-20)

In what field will you be working?
Please enter number from Specialties List .... (21-23)

Go to Item "W"

W. What is the name and address of the organization with which you will be associated?

....
(Name of Organization)

....
(Street) (City, State) (Or Country if not U.S.) (24-29)

BACKGROUND INFORMATION

X. Please indicate, by circling the highest grade attained, the education of

your father:	none	1 2 3	4 5 6	7 8	9 10 11	12	1 2 3	4	MA, MD	PhD	Postdoctoral	(30)
		Elementary school			High school		College		Graduate			
your mother	none	1 2 3	4 5 6	7 8	9 10 11	12	1 2 3	4	MA, MD	PhD	Postdoctoral	(31)
	0	1	2	3	4	5	6	7	8	9	(11)	

Signature .... Date completed .... (32-34)

APPENDIX C

LETTER TO EVALUATORS

COMMITTEE ON AN ASSESSMENT OF QUALITY-RELATED CHARACTERISTICS
OF RESEARCH-DOCTORATE PROGRAMS IN THE UNITED STATES

Established by the Conference Board of Associated Research Councils

Office of the Staff Director / National Research Council / 2101 Constitution Avenue, N.W. / Washington, D.C. 20418

April 14, 1981

Dear

As you may already know, our committee has undertaken an assessment of research-doctorate programs in U.S. universities. The study is examining approximately 2,650 programs in 31 fields in the arts and humanities, biological sciences, engineering, physical and mathematical sciences, and social sciences. A study prospectus is provided on the reverse of this page. You have been selected from a faculty list furnished by your institution to evaluate programs offering research-doctorates in the field of Biochemistry.

On the first page of the attached form is a list of the 139 programs that are being evaluated in this field. These programs produce more than 90 percent of the doctorate recipients in the field. In order to keep the task manageable, you are being asked to consider a randomly selected subset of 50 of these programs. These are designated with an asterisk in the list on the next page and are presented in random sequence on the evaluation sheets that follow. Please read the accompanying instructions carefully before attempting your evaluations.

We ask that you complete the attached survey form and return it in the enclosed envelope within the next three weeks. The evaluations you and your colleagues render will constitute an important component of this study. Your prompt attention to this request will be very much appreciated by our committee.

Sincerely,

Gardner Lindzey

Gardner Lindzey

Lyle V Jones

Lyle Jones
For the Study Committee

Enclosures

COMMITTEE MEMBERS

Lyle V. Jones, Co-Chairman
Gardner Lindzey, Co-Chairman
Paul A. Albrecht
Marcus Alexis
Robert M. Bock
Philip E. Converse
James H. M. Henderson
Ernest S. Kuh
Winfred P. Lehmann
Saunders Mac Lane
Nancy S. Milburn
Lincoln E. Moses
James C. Olson
Kumar Patel
Michael J. Pelczar, Jr.
Jerome B. Schneewind
Duane C. Spriestersbach
Harriet A. Zuckerman

RESEARCH-DOCTORATE PROGRAMS IN THE FIELD OF BIOCHEMISTRY
(* DESIGNATES THE PROGRAMS WHICH YOU ARE ASKED TO EVALUATE ON THE FOLLOWING PAGES.)

INSTITUTION - DEPARTMENT/ACADEMIC UNIT

UNIV OF ALABAMA SCH OF MED, BIRMINGHAM - BIOCHEMISTRY
UNIVERSITY OF ARIZONA, TUCSON - BIOCHEMISTRY
UNIV OF ARKANSAS MEDICAL CENTER, LITTLE ROCK - BIOCHEMISTRY
AUBURN UNIVERSITY - CHEMISTRY/ANIMAL AND DAIRY SCIENCES
BAYLOR COLLEGE OF MEDICINE, HOUSTON - BIOCHEMISTRY
BOSTON UNIVERSITY - MEDICAL AND DENTAL SCIENCES
BOSTON UNIVERSITY - INTERDEPARTMENTAL BIOCHEMISTRY PROGRAM
BRANDEIS UNIVERSITY - BIOCHEMISTRY
BROWN UNIVERSITY - BIOLOGY AND MEDICINE
BRYN MAWR COLLEGE - BIOLOGY/CHEMISTRY
UNIVERSITY OF CALIFORNIA, BERKELEY - BIOCHEMISTRY
* UNIVERSITY OF CALIFORNIA, DAVIS - BIOCHEMISTRY
UNIVERSITY OF CALIFORNIA, IRVINE - MOLECULAR BIOLOGY AND BIOCHEMISTRY/ BIOLOGICAL CHEM
UNIVERSITY OF CALIFORNIA, LOS ANGELES - CHEMISTRY/BIOLOGICAL CHEMISTRY
UNIVERSITY OF CALIFORNIA, RIVERSIDE - BIOCHEMISTRY
UNIVERSITY OF CALIFORNIA, SAN DIEGO - BIOLOGY
* UNIVERSITY OF CALIFORNIA, SAN DIEGO - CHEMISTRY
UNIVERSITY OF CALIFORNIA, SAN FRANCISCO - BIOCHEMISTRY
UNIVERSITY OF CALIFORNIA, SANTA BARBARA - BIOCHEMISTRY AND MOLECULAR BIOLOGY
CASE WESTERN RESERVE UNIVERSITY - BIOCHEMISTRY
UNIVERSITY OF CHICAGO - BIOCHEMISTRY
* UNIVERSITY OF CINCINNATI - BIOLOGICAL CHEMISTRY
* CUNY, THE GRADUATE SCHOOL - BIOCHEMISTRY
COLORADO STATE UNIVERSITY, FT COLLINS - BIOCHEMISTRY
* UNIVERSITY OF COLORADO, BOULDER - BIOCHEMISTRY/BIOPHYSICS/GENETICS
COLUMBIA UNIV-GRAD SCHOOL OF ARTS & SCI - BIOCHEMISTRY
* UNIVERSITY OF CONNECTICUT, STORRS - BIOLOGICAL SCIENCES
CORNELL UNIVERSITY, ITHACA - BIOCHEMISTRY, MOLECULAR AND CELL BIOLOGY
CORNELL UNIVERSITY MEDICAL CENTER, NYC - BIOCHEMISTRY
* DARTMOUTH COLLEGE - BIOCHEMISTRY
* UNIVERSITY OF DELAWARE, NEWARK - CHEMISTRY
* DUKE UNIVERSITY - BIOCHEMISTRY
EMORY UNIVERSITY - BIOCHEMISTRY
GEORGE WASHINGTON UNIVERSITY - BIOCHEMISTRY
GEORGETOWN UNIVERSITY - BIOCHEMISTRY
UNIVERSITY OF GEORGIA, ATHENS - BIOCHEMISTRY
* HARVARD UNIVERSITY - BIOCHEMISTRY AND MOLECULAR BIOLOGY (GRADUATE SCHOOL)
* HARVARD UNIVERSITY - BIOLOGICAL CHEMISTRY (MEDICAL SCH)
* UNIVERSITY OF HAWAII - BIOCHEMISTRY AND BIOPHYSICS
* UNIV OF HEALTH SCI/CHICAGO MEDICAL SCHOOL - BIOCHEMISTRY
UNIVERSITY OF HOUSTON - BIOPHYSICAL SCIENCES
HOWARD UNIVERSITY - BIOCHEMISTRY
* ILLINOIS INSTITUTE OF TECHNOLOGY - BIOLOGY
UNIV OF ILLINOIS AT URBANA-CHAMPAIGN - BIOCHEMISTRY
* UNIV OF ILLINOIS AT THE MED CTR, CHICAGO - BIOLOGICAL CHEMISTRY
INDIANA UNIV-PURDUE UNIV AT INDIANAPOLIS - BIOCHEMISTRY
* IOWA STATE UNIVERSITY, AMES - BIOCHEMISTRY AND BIOPHYSICS
UNIVERSITY OF IOWA, IOWA CITY - BIOCHEMISTRY
JOHNS HOPKINS UNIVERSITY - BIOCHEMISTRY
KANSAS STATE UNIVERSITY, MANHATTAN - BIOCHEMISTRY
UNIVERSITY OF KANSAS - BIOCHEMISTRY (GRADUATE SCHOOL)
* UNIVERSITY OF KANSAS - BIOCHEMISTRY (SCHOOL OF MEDICINE AT KANSAS CITY)
* UNIVERSITY OF KENTUCKY - BIOCHEMISTRY
LOMA LINDA UNIVERSITY - BIOCHEMISTRY
* LOUISIANA STATE UNIVERSITY, BATON ROUGE - BIOCHEMISTRY
UNIVERSITY OF LOUISVILLE - BIOCHEMISTRY
LOYOLA UNIVERSITY OF CHICAGO - BIOCHEMISTRY AND BIOPHYSICS
* UNIVERSITY OF MARYLAND, COLLEGE PARK - CHEMISTRY
* UNIV OF MARYLAND, BALTIMORE PROF SCHOOLS - BIOLOGICAL CHEMISTRY
* MASSACHUSETTS INSTITUTE OF TECHNOLOGY - BIOLOGY
UNIVERSITY OF MASSACHUSETTS, AMHERST - BIOCHEMISTRY
MEDICAL UNIVERSITY OF SOUTH CAROLINA, CHARLESTON - BIOCHEMISTRY
* COL OF MED & DENT OF NEW JERSEY (NEWARK) - BIOCHEMISTRY
* UNIVERSITY OF MIAMI (FLORIDA) - BIOCHEMISTRY
* MICHIGAN STATE UNIVERSITY, EAST LANSING - BIOCHEMISTRY
* UNIVERSITY OF MICHIGAN, ANN ARBOR - BIOLOGICAL CHEMISTRY
UNIVERSITY OF MINNESOTA - BIOCHEMISTRY (GRADUATE SCHOOL AND MEDICAL SCHOOL)
UNIVERSITY OF MISSOURI, COLUMBIA - BIOCHEMISTRY
UNIVERSITY OF NEBRASKA, LINCOLN - CHEMISTRY/SCHOOL OF LIFE SCIENCES
UNIVERSITY OF NEW HAMPSHIRE - BIOCHEMISTRY
NEW MEXICO STATE UNIVERSITY, ALAMAGORDO - CHEMISTRY
* NEW YORK UNIVERSITY - BASIC MEDICAL SCIENCES
* UNIVERSITY OF NORTH CAROLINA, CHAPEL HILL - BIOCHEMISTRY AND NUTRITION

NORTH CAROLINA STATE UNIVERSITY, RALEIGH - BIOCHEMISTRY
NORTH DAKOTA STATE UNIVERSITY, FARGO - BIOCHEMISTRY
* UNIVERSITY OF NORTH DAKOTA, GRAND FORKS - BIOCHEMISTRY
NORTHERN ILLINOIS UNIVERSITY, DE KALB - CHEMISTRY
NORTHWESTERN UNIVERSITY - BIOCHEMISTRY AND MOLECULAR BIOLOGY/ BIOCHEMISTRY
UNIVERSITY OF NOTRE DAME - CHEMISTRY
OHIO STATE UNIVERSITY - PHYSIOLOGICAL CHEMISTRY
OHIO STATE UNIVERSITY - BIOCHEMISTRY
OKLAHOMA STATE UNIVERSITY, STILLWATER - BIOCHEMISTRY
UNIVERSITY OF OKLAHOMA - BIOCHEMISTRY AND MOLECULAR BIOLOGY
UNIVERSITY OF OREGON, EUGENE - BIOLOGY/CHEMISTRY
OREGON STATE UNIVERSITY, COVALLIS - BIOCHEMISTRY AND BIOPHYSICS
PENNSYLVANIA STATE UNIVERSITY - BIOLOGICAL CHEMISTRY (MEDICAL CTR)
* PENNSYLVANIA STATE UNIVERSITY - BIOCHEMISTRY (GRADUATE SCHOOL)
UNIVERSITY OF PENNSYLVANIA - BIOCHEMISTRY
UNIVERSITY OF PITTSBURGH - BIOCHEMISTRY (SCHOOL OF MEDICINE)
UNIVERSITY OF PITTSBURGH - BIOLOGICAL SCIENCES (ARTS AND SCIENCES)
* PRINCETON UNIVERSITY - BIOCHEMICAL SCIENCES
* PURDUE UNIVERSITY, WEST LAFAYETTE - BIOLOGICAL SCIENCES
UNIVERSITY OF RHODE ISLAND - BIOCHEMISTRY/BIOPHYSICS
* RICE UNIVERSITY - BIOCHEMISTRY
UNIVERSITY OF ROCHESTER - BIOCHEMISTRY
* ROCKEFELLER UNIVERSITY - BIOCHEMISTRY
* RUTGERS UNIVERSITY, NEW BRUNSWICK - BIOCHEMISTRY
* SAINT LOUIS UNIVERSITY - BIOCHEMISTRY
* UNIVERSITY OF SOUTH DAKOTA, VERMILLION - BIOCHEMISTRY, PHYSIOLOGY, AND PHARMACOLOGY
* UNIVERSITY OF SOUTHERN CALIFORNIA - BIOCHEMISTRY
* SOUTHERN ILLINOIS UNIVERSITY, CARBONDALE - CHEMISTRY AND BIOCHEMISTRY
STANFORD UNIVERSITY - BIOCHEMISTRY
UNIVERSITY OF FLORIDA, GAINESVILLE - BIOCHEMISTRY AND MOLECULAR BIOLOGY
* SUNY AT ALBANY - BIOLOGICAL SCIENCES
SUNY AT BUFFALO - BIOCHEMISTRY (SCHOOL OF MEDICINE)
SUNY AT BUFFALO - BIOCHEMISTRY (ROSWELL PARK GRADUATE DIVISION)
* SUNY AT STONY BROOK - BIOCHEMISTRY
SUNY, DOWNSTATE MEDICAL CENTER (BROOKLYN) - BIOCHEMISTRY
SUNY, UPSTATE MEDICAL CENTER (SYRACUSE) - BIOCHEMISTRY
* SYRACUSE UNIVERSITY - BIOLOGY
SUNY, COL OF ENVIR SCI & FORESTRY (SYRACUSE) - SCHOOL OF BIOLOGY, CHEMISTRY, AND ECOLOGY
TEMPLE UNIVERSITY - BIOCHEMISTRY
UNIVERSITY OF TENNESSEE, KNOXVILLE - BIOCHEMISTRY
UNIV OF TENNESSEE-CTR FOR HEALTH SCI, MEMPHIS - BIOCHEMISTRY
TEXAS A&M UNIVERSITY - BIOCHEMISTRY AND BIOPHYSICS
* UNIVERSITY OF TEXAS, AUSTIN - CHEMISTRY
* UNIV OF TEXAS, MED BRANCH AT GALVESTON - HUMAN BIOLOGICAL CHEMISTRY AND GENETICS
UNIV OF TEXAS, HLTH SCI CTR AT HOUSTON - BIOCHEM & MOLECULAR BIO(MED SCH)/ BIOCHEM(ANDERSON HOSP)
* UNIV OF TEXAS, HLTH SCI CTR AT SAN ANTONIO - BIOCHEMISTRY
THOMAS JEFFERSON UNIVERSITY - BIOCHEMISTRY
* TULANE UNIVERSITY - BIOCHEMISTRY
* ALBANY MEDICAL COLLEGE - BIOCHEMISTRY
UNIVERSITY OF UTAH, SALT LAKE CITY - BIOCHEMISTRY
VANDERBILT UNIVERSITY - BIOCHEMISTRY
UNIVERSITY OF VERMONT - BIOCHEMISTRY
VIRGINIA COMMONWEALTH UNIVERSITY - BIOCHEMISTRY
VIRGINIA POLYTECHNIC INSTITUTE AND STATE UNIV - BIOCHEMISTRY AND NUTRITION
UNIVERSITY OF VIRGINIA - BIOCHEMISTRY
WAKE FOREST UNIVERSITY - BIOCHEMISTRY
WASHINGTON STATE UNIVERSITY, PULLMAN - BIOCHEMISTRY AND BIOPHYSICS
* UNIVERSITY OF WASHINGTON, SEATTLE - BIOCHEMISTRY
WAYNE STATE UNIVERSITY - BIOCHEMISTRY
WEST VIRGINIA UNIVERSITY - MEDICAL BIOCHEMISTRY
* WEST VIRGINIA UNIVERSITY - AGRICULTURAL BIOCHEMISTRY
UNIVERSITY OF WISCONSIN, MADISON - PHYSIOLOGICAL CHEMISTRY
UNIVERSITY OF WISCONSIN, MADISON - BIOCHEMISTRY
* UNIVERSITY OF WYOMING - BIOCHEMISTRY
YALE UNIVERSITY - MOLECULAR BIOPHYSICS AND BIOCHEM/ PHARMACOLOGY/ BIOLOGY
ALBERT EINSTEIN COLLEGE OF MEDICINE - BIOCHEMISTRY

INSTRUCTIONS

At the top of the next page please provide the information requested on the highest degree you hold and your current field of specialization. You may be assured that all information you furnish on the survey form is to be used for purposes of statistical description only and that the confidentiality of your responses will be protected.

On the pages that follow you are asked to judge 50 programs (presented in random sequence) that offer the research-doctorate. Each program is to be evaluated in terms of: (1) scholarly quality of program faculty; (2) effectiveness of program in educating research scholars/scientists; and (3) change in program quality in the last five years (see below). Although the assessment is limited to these factors, our committee recognizes that other factors are relevant to the quality of doctoral programs, and that graduate programs serve important purposes in addition to that of educating doctoral candidates.

A list of the faculty members signficantly involved in each program, the name of the academic unit in which the program is offered, and the number of doctorates awarded in that program during the last five years have been printed on the survey form (whenever available). Although this information has been furnished to us by the institution and is believed to be accurate, it has not been verified by our study committee and may have a few omissions, misspellings, or other errors.

Before marking your responses on the survey form, you may find it helpful to look over the full set of programs you are being asked to evaluate. In making your judgments about each program, please keep in mind the following instructions:

(1) Scholarly Quality of Program Faculty. Check the box next to the term that most closely corresponds to your judgment of the quality of faculty in the research-doctorate program described. Consider only the scholarly competence and achievements of the faculty. It is suggested that no more than five programs be designated "distinguished."

(2) Effectiveness of Program in Educating Research Scholars/Scientists. Check the box next to the term that most closely corresponds to your judgment of the doctoral program's effectiveness in educating research scholars/scientists. Consider the accessibility of the faculty, the curricula, the instructional and research facilities, the quality of graduate students, the performance of the graduates, and other factors that contribute to the effectiveness of the research-doctorate program.

(3) Change in Program Quality in Last Five Years. Check the box next to the term that most closely corresponds to your estimate of the change that has taken place in the research-doctorate program in the last five years. Consider both the scholarly quality of the program faculty and the effectiveness of the program in educating research scholars/scientists. Compare the quality of the program today with its quality five years ago--not the change in the program's relative standing among other programs in the field.

In assessing each of these factors, mark the category "Don't know well enough to evaluate" if you are unfamiliar with that aspect of the program. It is quite possible that for some programs you may be knowledgeable about the scholarly quality of the faculty, but not about the effectiveness of the program or change in program quality.

For each of the programs identified, you are also asked to indicate the extent to which you are familiar with the work of members of the program faculty. For example, if you recognize only a very small fraction of the faculty, you should mark the category "Little or no familiarity."

Please be certain that you have provided a set of responses for each of the programs identified on the following pages. The fully completed survey form should be returned in the enclosed envelope to:

Committee on an Assessment of Quality-Related
Characteristics of Research-Doctorate Programs
National Research Council, JH-638
2101 Constitution Avenue, N.W.
Washington, D.C. 20418

Our committee will be most appreciative of your thoughtful assessment of these research-doctorate programs. We welcome any comments you may wish to append to the completed survey form.

PLEASE PROVIDE THE FOLLOWING INFORMATION: FORM NO. 2203-01

HIGHEST DEGREE YOU HOLD: ( ) PH.D. ( ) OTHER (PLEASE SPECIFY): ____________________

YEAR OF HIGHEST DEGREE: ________

INSTITUTION OF HIGHEST DEGREE: ____________________

YOUR CURRENT FIELD OF SPECIALIZATION (CHECK ONLY ONE):

A. ( ) ANATOMY
B. ( ) ANIMAL SCIENCES
C. ( ) BIOCHEMISTRY
D. ( ) BIOPHYSICS
E. ( ) BOTANY
F. ( ) CELL BIOLOGY
G. ( ) ECOLOGY
H. ( ) ENTOMOLOGY
I. ( ) GENERAL BIOLOGY
J. ( ) GENETICS
K. ( ) IMMUNOLOGY
L. ( ) MICROBIOLOGY/BACTERIOLOGY
M. ( ) MOLECULAR BIOLOGY
N. ( ) NUTRITION/FOOD SCIENCE
O. ( ) PATHOLOGY
P. ( ) PHARMACOLOGY/TOXICOLOGY
Q. ( ) PHYSIOLOGY, ANIMAL/HUMAN
R. ( ) PHYSIOLOGY, PLANT
S. ( ) PHYTOPATHOLOGY
T. ( ) PUBLIC HEALTH/EPIDEMIOLOGY
U. ( ) ZOOLOGY
V. ( ) OTHER (PLEASE SPECIFY): ____________________

INSTITUTION: UNIVERSITY OF CINCINNATI
DEPARTMENT/ACADEMIC UNIT: BIOLOGICAL CHEMISTRY
TOTAL DOCTORATES AWARDED 1976-80: 12

FORM NO. 2203-01

PROFESSORS: James H. FREISHEIM, Richard JACKSON, Jerry B. LINGREL, Harry RUDNEY

ASSOCIATE PROFESSORS: Richard W. ARMENTROUT, W. David BEHNKE, Eric I. GRUENSTEIN, Judith A. K. HARMONY, Robert C. KRUEGER, James D. OGLE, Amadeo J. PESCE

ASSISTANT PROFESSORS: Kenneth M. BLUMENTHAL, Ronald D. BROWN, Donal LUSE, Bruce MOULTON

SCHOLARLY QUALITY OF PROGRAM FACULTY

1. ( ) DISTINGUISHED
2. ( ) STRONG
3. ( ) GOOD
4. ( ) ADEQUATE
5. ( ) MARGINAL
6. ( ) NOT SUFFICIENT FOR DOCTORAL EDUCATION

0. ( ) DON'T KNOW WELL ENOUGH TO EVALUATE

FAMILIARITY WITH WORK OF PROGRAM FACULTY

1. ( ) CONSIDERABLE FAMILIARITY
2. ( ) SOME FAMILIARITY
3. ( ) LITTLE OR NO FAMILIARITY

EFFECTIVENESS OF PROGRAM IN EDUCATING RESEARCH SCHOLARS/SCIENTISTS

1. ( ) EXTREMELY EFFECTIVE
2. ( ) REASONABLY EFFECTIVE
3. ( ) MINIMALLY EFFECTIVE
4. ( ) NOT EFFECTIVE

0. ( ) DON'T KNOW WELL ENOUGH TO EVALUATE

CHANGE IN PROGRAM QUALITY IN LAST FIVE YEARS

1. ( ) BETTER THAN FIVE YEARS AGO
2. ( ) LITTLE OR NO CHANGE IN LAST FIVE YEAR
3. ( ) POORER THAN FIVE YEARS AGO

0. ( ) DON'T KNOW WELL ENOUGH TO EVALUATE

INSTITUTION: MICHIGAN STATE UNIVERSITY, EAST LANSING **FORM NO. 2203-02**
DEPARTMENT/ACADEMIC UNIT: BIOCHEMISTRY
TOTAL DOCTORATES AWARDED 1976-80: 34

PROFESSORS: Richard ANDERSON, Charles ARNTZEN, Steven AUST, Loran BIEBER, William DEAL, James FAIRLEY, Philip FILNER, Paul KINDEL, Hans LILLEVIK, Richard LUECKE, Veronica MAHER, David MCCONNELL, Justin MCCORMICK, Allan MORRIS, Fritz ROTTMAN, John SPECK, Clarence SUELTER, Charles SWEELEY, N. E. TOLBERT, Jack WATSON, William WELLS, John WILSON, Willis WOOD

ASSOCIATE PROFESSORS: Deboran DELMER, Pamela FRAKER, William SMITH

ASSISTANT PROFESSORS: Jerry DODGSON, Edward FRITSCH, Roger KOBES, Hsing Jien KUNG, Shelagh Ferguson MILLER, Arnold REVZIN, Melvin SCHINDLER, Karel SCHUBERT, John WANG

OTHER STAFF: Susan HAWKES, John HOLLAND

SCHOLARLY QUALITY OF PROGRAM FACULTY

1. ( ) DISTINGUISHED
2. ( ) STRONG
3. ( ) GOOD
4. ( ) ADEQUATE
5. ( ) MARGINAL
6. ( ) NOT SUFFICIENT FOR DOCTORAL EDUCATION

0. ( ) DON'T KNOW WELL ENOUGH TO EVALUATE

FAMILIARITY WITH WORK OF PROGRAM FACULTY

1. ( ) CONSIDERABLE FAMILIARITY
2. ( ) SOME FAMILIARITY
3. ( ) LITTLE OR NO FAMILIARITY

EFFECTIVENESS OF PROGRAM IN EDUCATING RESEARCH SCHOLARS/SCIENTISTS

1. ( ) EXTREMELY EFFECTIVE
2. ( ) REASONABLY EFFECTIVE
3. ( ) MINIMALLY EFFECTIVE
4. ( ) NOT EFFECTIVE

0. ( ) DON'T KNOW WELL ENOUGH TO EVALUATE

CHANGE IN PROGRAM QUALITY IN LAST FIVE YEARS

1. ( ) BETTER THAN FIVE YEARS AGO
2. ( ) LITTLE OR NO CHANGE IN LAST FIVE YEAR
3. ( ) POORER THAN FIVE YEARS AGO

0. ( ) DON'T KNOW WELL ENOUGH TO EVALUATE

INSTITUTION: UNIV OF ILLINOIS AT THE MED CTR, CHICAGO **FORM NO. 2203-03**
DEPARTMENT/ACADEMIC UNIT: BIOLOGICAL CHEMISTRY
TOTAL DOCTORATES AWARDED 1976-80: 25

PROFESSORS: Michael BARANY, Clyde C. DOUGHTY, Henry GEWURZ, Mary Sue HANLON, Thomas D. HENDERSON, Henry JEFFAY, Janos MOLNAR, Terrell C. MYERS, Mariano TAO, Edward B. TITCHENER, James VARY, Bernard WEISSMAN

ASSOCIATE PROFESSORS: Charalampos ARSENIS, Bernard FRIEDENSON, Paul MORRIS, Tarakad RAJKUMAR, Newton RESSLER

ASSISTANT PROFESSORS: Robert V. STORTI

SCHOLARLY QUALITY OF PROGRAM FACULTY

1. ( ) DISTINGUISHED
2. ( ) STRONG
3. ( ) GOOD
4. ( ) ADEQUATE
5. ( ) MARGINAL
6. ( ) NOT SUFFICIENT FOR DOCTORAL EDUCATION

0. ( ) DON'T KNOW WELL ENOUGH TO EVALUATE

FAMILIARITY WITH WORK OF PROGRAM FACULTY

1. ( ) CONSIDERABLE FAMILIARITY
2. ( ) SOME FAMILIARITY
3. ( ) LITTLE OR NO FAMILIARITY

EFFECTIVENESS OF PROGRAM IN EDUCATING RESEARCH SCHOLARS/SCIENTISTS

1. ( ) EXTREMELY EFFECTIVE
2. ( ) REASONABLY EFFECTIVE
3. ( ) MINIMALLY EFFECTIVE
4. ( ) NOT EFFECTIVE

0. ( ) DON'T KNOW WELL ENOUGH TO EVALUATE

CHANGE IN PROGRAM QUALITY IN LAST FIVE YEARS

1. ( ) BETTER THAN FIVE YEARS AGO
2. ( ) LITTLE OR NO CHANGE IN LAST FIVE YEAR
3. ( ) POORER THAN FIVE YEARS AGO

0. ( ) DON'T KNOW WELL ENOUGH TO EVALUATE

APPENDIX D

THE ARL LIBRARY INDEX

(SOURCE: Mandel, Carol A., and Mary P. Johnson, ARL Statistics 1979-80, Association of Research Libraries, Washington, D.C., 1980, pp. 23-24.)

The data tables at the beginning of the ARL Statistics display figures reported by ARL member libraries in 22 categories that, with the exception of the measures of interlibrary loan activity, describe the size of ARL libraries in terms of holdings, expenditures, and personnel. The rank order tables provide an overview of the ranges and medians for 14 of these categories, or variables, among ARL academic libraries as well as quantitatively comparing each library with other ARL member institutions. However, none of the 22 variables provides a summary measure of a library's relative size within ARL or characterizes the ARL libraries as a whole.

The ARL Library Index has been derived as a means of providing this summary characterization, permitting quantitative comparisons of ARL academic libraries, singly and as a group, with other academic libraries. Through the use of statistical techniques known as factor analysis, it can be determined that 15 of the variables reported to ARL are more closely correlated with each other than with other categories. Within this group of 15 variables, some are subsets or combinations of materials. When the subsets and combinations are eliminated, 10 variables emerge as characteristic of ARL libary size. These are: volumes held, volumes added (gross), microform units held, current serials received, expenditures for library materials, expenditures for binding, total salary and wage expenditures, other operating expenditures, number of professional staff, and number of nonprofessional staff.

These 10 categories delineate an underlying dimension, or factor, of library size. By means of principal component analysis, a technique that is a variant of factor analysis, it is possible to calculate the correlations of each of the variables with this hypothetical factor of library size. From this analysis a weight for each variable can be determined based on how closely that variable is correlated with the overall dimension of library size defined by all 10 categories. A high correlation indicates that much of the variation in ARL library size is accounted for by the variable in question, implying a characteristic in which ARL libraries are relatively alike. The component score coefficients, or weights, for

the 1979-80 ARL academic library data are as follows:

Volumes held	.12108
Volumes added (gross)	.11940
Microforms held	.07509
Current serials received	.12253
Expenditures for library materials	.12553
Expenditures for binding	.11266
Expenditures for salaries and wages	.12581
Other operating expenditures	.10592
Number of professional staff	.12347
Number of nonprofessional staff	.11297

From these weights an individual library can compute an index score that will indicate its relative position among ARL libraries with respect to the overall factor of library size. The data for each of the 10 variables are converted to standard normal form and multiplied by the appropriate weight. The resulting scores are expressed in terms of the number of standard deviations above or below the mean index score for ARL academic libraries. Thus, the formula* for calculating a library's 1979-80 index score is as follows:

.12108 (log of volumes held - 6.2916)/.2172
+.11940 (log of volumes added gross - 4.8412)/.2025
+.07509 (log of microforms - 6.0950)/.1763
+.12253 (log of current serials - 4.3432)/.2341
+.12553 (log of expenditures for materials - 6.2333)/.1636
+.11266 (log of expenditures for binding - 5.0480)/.2475
+.12581 (log of total salaries - 6.4675)/.2103
+.10592 (log of operating expenditures - 5.6773)/.2635
+.12347 (log of professional staff - 1.8281)/.1968
+.11297 (log of nonprofessional staff - 2.1512)/.2046

The index scores for the 99 academic libraries that were members of ARL during 1979-80 are shown on the following page. It is important to emphasize that these scores are only a summary description of library size, distributing ARL libraries along a normal curve, based on 10 quantitative measures that are positively correlated with one another in ARL libraries. The scores are in no way a qualitative assessment of the collections, services, or operations of these libraries.

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*For calculation on a hand calculator, the formula can be mathematically simplified to: (.55746 x log of volumes held) + (.58963 x log of volumes added gross) + (.42592 x log of microforms) + (.52341 x log of current serials) + (.76730 x log of expenditures for materials) + (.45519 x log of expenditures for binding) + (.59824 x log of total salaries) + (.40197 x log of operating expenditures) + (.62739 x log of professional staff) + (.55215 x log of nonprofessional staff) - 26.79765.

APPENDIX E

FACULTY RESEARCH SUPPORT

The names of National Science Foundation (NSF) research grant awardees were obtained from a file maintained by the NSF Division of Information Systems. The file provided to the committee covered all research grant awards made in FY1978, FY1979, and FY1980 and included the names of the principal investigator and co-principal investigators for each award. Also available from this file was information concerning the field of science/engineering of the research grant and the institution with which the investigator was affiliated. This information was used in identifying which research grant recipients were on the program faculty lists provided by institutional coordinators.

The names of National Institutes of Health (NIH) and Alcohol, Drug Abuse, and Mental Health Administration (ADAMHA) research grant recipients (principal investigators only) were obtained from the NIH Information for Management Planning, Analysis, and Coordination System. This system contains a detailed record of all applications and awards in the various training and research support programs of these agencies. For the purposes of this study, information analogous to that available from the NSF file was extended for FY1978-80 research grant awardees and their records were matched with the program faculty lists. Measure 13 constitutes the fraction of program faculty members who had received one or more research grant awards from NSF (including both principal investigators and co-principal investigators), NIH, or ADAMHA during the FY1978-80 period.

R&D EXPENDITURES

Total university expenditures for R&D activities are available from the NSF Survey of Scientific and Engineering Expenditures at Universities and Colleges. A copy of the survey form appears on the following pages.

NSF FORM 411 (Dec 1979)

FORM APPROVED
OMB No. 99-R0279

NATIONAL SCIENCE FOUNDATION
Washington, D.C. 20550

SURVEY OF SCIENTIFIC AND ENGINEERING EXPENDITURES AT UNIVERSITIES AND COLLEGES, FY 1979

(Current and Capital Expenditures for Research, Development, and Instruction in the Sciences and Engineering)

Organizations are requested to complete and return this form to:

NATIONAL SCIENCE FOUNDATION
1800 G Street, N.W.
Washington, D.C. 20550
Attn: UNISG

This form should be returned by February 1, 1980. Your cooperation in returning the survey questionnaire promptly is very important.

Financial data are requested for your institution's 1979 fiscal year.

This information is solicited under the authority of the National Science Foundation Act of 1950, as amended. All information you provide will be used for statistical purposes only. Your response is entirely voluntary and your failure to provide some or all of the information will in no way adversely affect your institution.

All financial data requested on this form should be reported in thousands of dollars; for example, an expenditure of $25,342 should be rounded to the nearest thousand dollars and reported as $25.

Where exact data are not available, estimates are acceptable. Your estimates will be better than ours.

Please correct if name or address has changed

(Includes aggregate data from 567 universities and colleges but excludes 19 university-administered FFRDC's)

Include data for branches and all organizational units of your institution, such as medical schools and agricultural experiment stations. Also include hospitals or clinics owned, operated, or controlled by universities, and integrated operationally with the clinical programs of your medical schools. Exclude data for federally funded research and development centers (FFRDC's). A separate questionnaire is included in this package if your institution administers an FFRDC. **If you have any questions please contact Jim Hoehn (202-634-4674).**

Please enter the beginning and ending dates of your institution's fiscal year for which you are reporting on this form:

________________ through ________________

Please note in space below:
(1) Any suggestions to improve the design of the survey questionnaire, (2) any suggestions to improve the instructions, or (3) any comments on significant change in R&D in your institution.

(Attach additional sheets, if necessary.)

PLEASE TYPE OR PRINT NAME OF PERSON SUBMITTING THIS FORM	TITLE	AREA CODE	EXCH	NO.	EXT
NAME OF PERSON WHO PREPARED THIS SUBMISSION (If different from above)	TITLE	AREA CODE	EXCH	NO.	EXT
Please check and correct if necessary the name and address of your institution shown on the mailing label.		DATE			

ITEM 1. CURRENT EXPENDITURES FOR SEPARATELY BUDGETED RESEARCH AND DEVELOPMENT (R&D) IN THE SCIENCES AND ENGINEERING, BY SOURCE OF FUNDS AND BASIC RESEARCH, FY 1979 (Include indirect costs)

ITEMS 1. & 2. INSTRUCTIONS

Separately budgeted research and development (R&D) includes all funds expended for activities specifically organized to produce research outcomes and commissioned by an agency either external to the institution or separately budgeted by an organizational unit within the institution. **Include** equipment purchased under research project awards as part of "current funds." Research funds subcontracted to outside organizations should also be included. **Exclude** training grants, public service grants, demonstration projects, etc.

Under a. **Federal Government.** Report grants and contracts for R&D by all agencies of the Federal Government including indirect costs from these sources.

Under b. **State and local governments.** Include funds for R&D from State, county, municipal, or other local governments and their agencies. Include here State funds which support R&D at agricultural experiment stations.

Under c. **Industry.** Include all grants and contracts for R&D from profitmaking organizations, whether engaged in production, distribution, research, service, or other activities. Do not include grants and contracts from nonprofit foundations financed by industry, which should be reported under **All other sources**.

Under d. **Institutional funds.** Report funds which your institution spent for R&D activities including indirect costs from the following sources: (1) General-purpose State or local government appropriations; (2) general-purpose grants from industry, foundations, or other outside sources; (3) tuition and fees; (4) endowment income. In addition, estimate your institution's contribution to unreimbursed indirect costs incurred in association with R&D projects financed by outside organizations, and mandatory cost sharing on Federal and other grants. To estimate unreimbursed indirect costs, many institutions use a university-wide negotiated indirect cost rate multiplied by the base (e.g., direct salaries and wages, etc.) minus actual indirect cost recoveries. If your institution now separately budgets what was previously classified as departmental research, these data should be included in line d.

Under e. **All other sources.** Include foundations and voluntary health agencies grants for R&D, as well as all other sources not elsewhere classified. Funds from foundations which are affiliated with or grant solely to your institution should be included under d. Institutional funds. Funds for R&D received from a health agency that is a unit of a State or local government should be reported under State and local governments. Also include gifts from individuals that are restricted by the donor to research.

Please exclude from your response any R&D expenditures in the fields of education, law, humanities, music, the arts, physical education, library science, and all other nonscience fields.

Source of funds		(1) Total R&D expenditures	(2) Basic research
		(Dollars in thousands)	(Percent of column 1)
a. Federal Government	1110	$ 3,431,538	73.4 %
*b. State and local governments	1125	467,311	**Basic research** is directed toward an increase of knowledge; it is research where the primary aim of the **investigator** is a fuller knowledge or understanding of the subject under study rather than a practical application thereof.
c. Industry	1150	193,794	
d. Institutional funds	1160	716,241	
(1) Separately budgeted	1161	357,926	
(2) Underrecovery of indirect costs and cost sharing	1162	358,315	
*e. All other sources	1175	373,845	
f. TOTAL (sum of a through [illegible]	1100	$ 5,182,729	68.5 %

*Combined data cell (See instructions for b and e).

CONFIDENTIALITY

Information received from individual institutions in lines 1161 and 1162, or estimates for basic research expenditures, will **not** be published or released; only aggregate totals will appear in publications.

Total R&D expenditures reported in line 1100 column (1) and line 1400 column (1) should be the same.
Federally financed R&D expenditures reported in line 1100 column (1) and line 1400 column (2) should be the same.

ITEM 2 TOTAL AND FEDERALLY FINANCED EXPENDITURES FOR SEPARATELY BUDGETED RESEARCH AND DEVELOPMENT, BY FIELD OF SCIENCE, FY 1979 (Include indirect costs and equipment).

Field of science	Illustrative disciplines		(Dollars in thousands)	
			(1) Total	(2) Federal
a. ENGINEERING (TOTAL)	Aeronautical, agricultural, chemical, civil, electrical, industrial, mechanical, metallurgical, mining, nuclear, petroleum, bio- and biomedical, energy, textile, architecture	1410	$ 715,454	$ 474,866
b. PHYSICAL SCIENCES (TOTAL)		1420	559,566	448,992
(1) Astronomy	Astrophysics, optical and radio, x-ray, gamma-ray, neutrino	1421	39,026	26,862
(2) Chemistry	Inorganic, organo-metallic, organic, physical, analytical, pharmaceutical, polymer science (exclude biochemistry)	1422	204,062	154,031
(3) Physics	Acoustics, atomic and molecular, condensed matter, elementary particles, nuclear structure, optics, plasma	1423	275,680	236,872
(4) Other	Used for multidisciplinary projects within physical sciences and for disciplines not requested separately	1424	40,798	31,227
c. ENVIRONMENTAL SCIENCES (TOTAL)	ATMOSPHERIC SCIENCES: Aeronomy, solar weather modification, meteorology, extra-terrestrial atmospheres GEOLOGICAL SCIENCES: Engineering geophysics, geology, geodesy, geomagnetism, hydrology, geochemistry, paleomagnetism, paleontology, physical geography, cartography, seismology, soil sciences OCEANOGRAPHY: Chemical, geological, physical, marine geophysics, marine biology, biological oceanography	1430	429,129	307,493
d. MATHEMATICAL AND COMPUTER SCIENCES (TOTAL)		1440	145,087	94,534
(1) Mathematics	Algebra, analysis, applied mathematics, foundations and logic, geometry, numerical analysis, statistics, topology	1441	65,637	49,043
(2) Computer sciences	Design, development, and application of computer capabilities to data storage and manipulation, information science	1442	79,450	45,491
e. LIFE SCIENCES (TOTAL)		1450	2,814,824	1,810,729
(1) Biological sciences	Anatomy, biochemistry, biophysics, biogeography, ecology, embryology, entomology, genetics, immunology, microbiology, nutrition, parasitology, pathology, pharmacology, physical anthropology, physiology, botany, zoology	1451	949,993	690,805
(2) Agricultural	Agricultural chemistry, agronomy, animal science, conservation, dairy science, plant science, range science, wildlife	1452	565,697	168,849
(3) Medical	Anesthesiology, cardiology, endocrinology, gastroenterology, hematology, neurology, obstetrics, opthalmology, preventive medicine and community health, psychiatry, radiology, surgery, veterinary medicine, dentistry, pharmacy	1453	1,214,442	890,612
(4) Other	Used for multidisciplinary projects within life sciences	1454	84,692	60,463
f. PSYCHOLOGY (TOTAL)	Animal behavior, clinical, educational, experimental, human development and personality, social	1460	99,732	72.256
g. SOCIAL SCIENCES (TOTAL)		1470	290,057	153,674
(1) Economics	Econometrics, international, industrial, labor, agricultural, public finance and fiscal policy	1471	85,415	40,641
(2) Political science	Regional studies, comparative government, international relations, legal systems, political theory, public administration	1472	39,029	18,452
(3) Sociology	Comparative and historical, complex organizations, culture and social structure, demography, group interactions, social problems and welfare, theory	1473	72,669	46,739
(4) Other	History of science, cultural anthropology, linguistics, socio-economic geography	1474	92,944	47,842
h. OTHER SCIENCES, n.e.c. (TOTAL)*	To be used when the multidisciplinary and interdisciplinary aspects make the classification under one primary field impossible	1480	128,880	68,994
i. TOTAL (SUM of a through h) Check to insure that column totals are identical with data reported in item 1.		1400	5,182,729	3,431,538

*PLEASE EXCLUDE FROM YOUR RESPONSE ANY R&D EXPENDITURES IN THE FIELDS OF EDUCATION, LAW, HUMANITIES, MUSIC, THE ARTS, PHYSICAL EDUCATION, LIBRARY SCIENCE, AND ALL OTHER NONSCIENCE FIELDS.

ITEM 3. CAPITAL EXPENDITURES FOR SCIENTIFIC AND ENGINEERING FACILITIES AND EQUIPMENT FOR RESEARCH, DEVELOPMENT, AND INSTRUCTION, BY FIELD OF SCIENCE AND SOURCE OF FUNDS, FY 1979

ITEM 3. INSTRUCTIONS

Report funds for facilities which were in process or completed during FY 1979. Expenditures for administration buildings, steam plants, residence halls, and other such facilities should be excluded unless utilized principally for research, development, or instruction in engineering or in the sciences. Land costs should be **excluded**. Exclude small equipment items in your current fund account costing approximately $300 or less per unit or as recommended by the Joint Accounting Group (JAG) or as determined by your institutional policy; these are to be reported under items 1 and 2.

Facilities and equipment expenditures **include** the following: (a) Fixed equipment such as built-in equipment and furnishings; (b) movable scientific equipment such as oscilloscopes and pulse-height analyzers; (c) movable furnishings such as desk; (d) architect's fees, site work, extension of utilities, and the building costs of service functions such as integral cafeterias and bookstores of a facility; (e) facilities constructed to house separate components such as medical schools and teaching hospitals; and (f) special separate facilities used to house scientific apparatus such as accelerators, oceanographic vessels, and computers.

Field of science		(Dollars in thousands)		
		Total (1)	Federal (2)	All other sources (3)
a. **Engineering**	1710	$ 95,399	$ 22,060	$ 73,339
b. **Physical sciences**	1720	64,551	32,439	32,112
c. **Environmental sciences**	1730	25,293	8,970	16,323
d. **Mathematical and computer sciences**	1740	27,465	3,049	24,416
e. **Life sciences**	1750	456,477	92,567	363,910
f. **Psychology**	1760	7,803	1,767	6,036
g. **Social sciences**	1770	20,932	2,069	18,863
h. **Other sciences**, n.e.c.	1780	31,984	5,054	26,930
i. **Total (sum of a through h)**	1700	$ 729,904	$ 167,975	$ 561,929

APPENDIX F

DATA ON PUBLICATION RECORDS

Data for these measures were provided by a subcontractor, Computer Horizons, Inc. A detailed description of the derivation of these measures and examples of their use is given in:

> Francis Narin, Evaluative Bibliometrics: The Use of Publications and Citations Analysis in the Evaluation of Scientific Activity, Report to the National Science Foundation, March 1976.

The following pages have been excerpted from Chapters VI and VII of this report and describe operational considerations in compiling the publication records included here (measure 15) and the methodology used in determining the "influence" of published articles (measure 16).

VI. OPERATIONAL CONSIDERATIONS

A. Basics of Publication and Citation Analysis

The first section of this chapter discusses the major stages of publication and citation analysis techniques in evaluative bibliometrics. Later sections of the chapter consider publication and citation count parameters in further detail, including discussions of data bases, of field-dependent characteristics of the literature, and of some cautions and hazards in performing citation analyses for individual scientists.

The basic stages which must be kept in mind when doing a publication or citation analysis are briefly summarized in Figure 6-1.

1. Type of Publication

For a publication analysis the fundamental decision is which type of publication to count. A basic count will include all regular scientific articles. However, notes are often counted since some engineering and other journals often contain notes with significant technical content. Reviews may be included. Letters-to-the-editor must also be considered as a possible category for inclusion, since some important journals are sometimes classified as letter journals. For example, publications in Physical Review Letters were classified as letters by the Science Citation Index prior to 1970, although they are now classified as articles.

For most counts in the central core of the scientific literature, articles, notes and reviews are used as a measure of scientific output. When dealing with engineering fields, where many papers are presented at meetings accompanied by reprints and published proceedings, meeting presentations must also be considered. In some applied fields, i.e., agriculture, aerospace and nuclear engineering, where government support has been particularly comprehensive, the report literature may also be important. Unfortunately, reports generally contain few references, and citations to them are limited so they are not amenable to the normal citation analyses.

Books, of course, are a major type of publication, especially in the social sciences where they are often used instead of a series of journal articles. In bibliometrics a weighting of n articles equal to one book is frequently used; no uniformly acceptable value of n is available. A few of the papers discussed in Chapter V contain such measures.

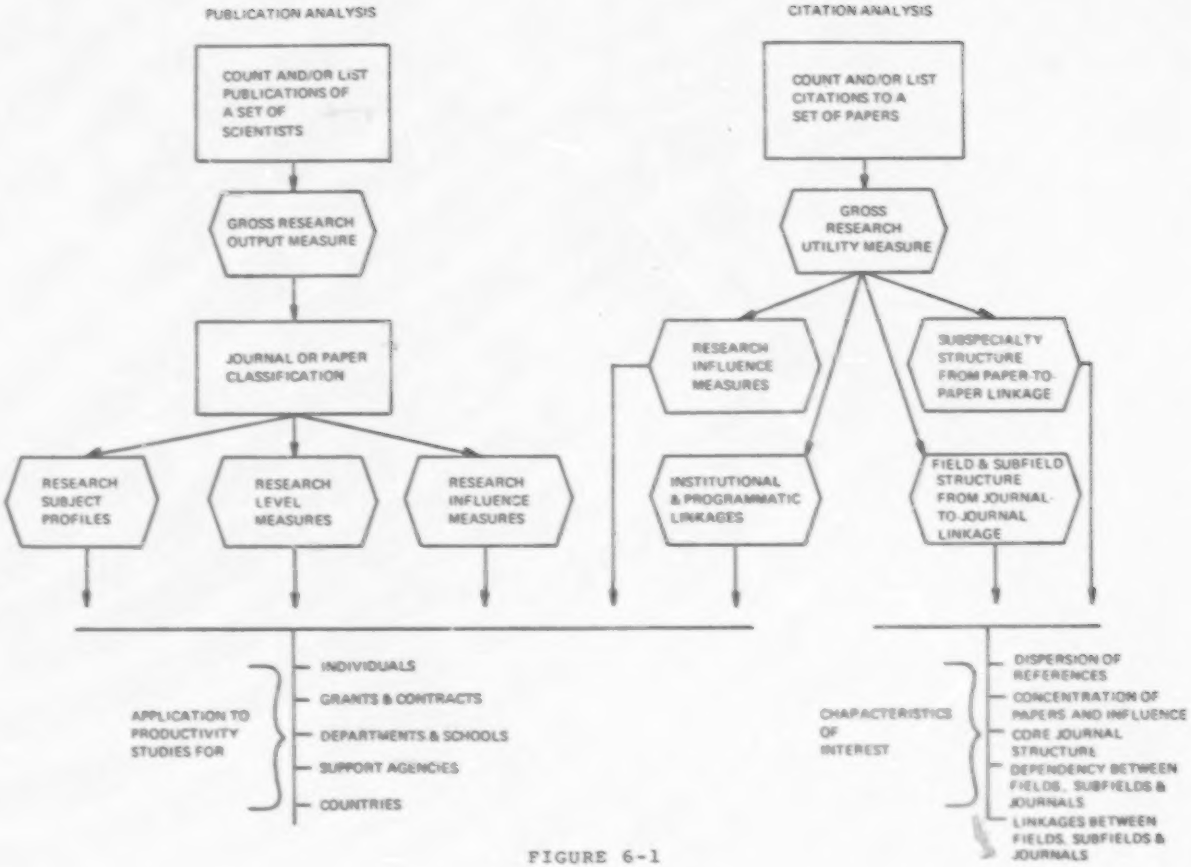
PUBLICATION ANALYSIS
COUNT AND/OR LIST PUBLICATIONS OF A SET OF SCIENTISTS
GROSS RESEARCH OUTPUT MEASURE
JOURNAL OR PAPER CLASSIFICATION
RESEARCH SUBJECT PROFILES
RESEARCH LEVEL MEASURES
RESEARCH INFLUENCE MEASURES
APPLICATION TO PRODUCTIVITY STUDIES FOR
INDIVIDUALS
GRANTS & CONTRACTS
DEPARTMENTS & SCHOOLS
SUPPORT AGENCIES
COUNTRIES
CITATION ANALYSIS
COUNT AND/OR LIST CITATIONS TO A SET OF PAPERS
GROSS RESEARCH UTILITY MEASURE
RESEARCH INFLUENCE MEASURES
SUBSPECIALTY STRUCTURE FROM PAPER-TO-PAPER LINKAGE
INSTITUTIONAL & PROGRAMMATIC LINKAGES
FIELD & SUBFIELD STRUCTURE FROM JOURNAL-TO-JOURNAL LINKAGE
CHARACTERISTICS OF INTEREST
DISPERSION OF REFERENCES
CONCENTRATION OF PAPERS AND INFLUENCE
CORE JOURNAL STRUCTURE
DEPENDENCY BETWEEN FIELDS, SUBFIELDS & JOURNALS
LINKAGES BETWEEN FIELDS, SUBFIELDS & JOURNALS

FIGURE 6-1

STAGES OF PUBLICATION AND CITATION ANALYSIS

2. Time Spans

A second important decision in making a publication count is to select the time span of interest. In the analysis of the publications of an institution a fixed time span, usually one year or more, is most appropriate. In comparing publication histories of groups of scientists, their professional ages (normally defined as years since attaining the PhD degree) must be comparable so that the build-up of publications at the beginning of a career or the decline at the end will not complicate the results. A typical scientist's first publication appears soon after his dissertation; if he continued working as a scientist, his publications may continue for thirty or more years.

The accurate control of the time span of a count is not as trivial as it might seem. Normally, the publication count is made from secondary sources (abstracting or indexing services) rather than from scanning the publications individually. Since most abstracting and indexing sources have been expanding their coverage over time, any publication count covering more than a few years must give careful consideration to changes in coverage. Furthermore, the timeliness of the secondary sources varies widely, with sources dependent on outside abstractors lagging months or even years behind. Since these abstracting lags may depend upon language, field and country of origin, they are a particular problem in international publication counts.

The *Science Citation Index* is one of the most current secondary sources, with some 80% to 90% of a given year's publications in the *SCI* for that year.

Of course, no abstracting or indexing service can be perfect, since some journals are actually published months after their listed publication dates. Nevertheless, variations in timeliness are large from one service to another.

3. Comprehensiveness of Source Coverage

An important consideration in making a publication count is the comprehensiveness of the source coverage. Most abstracting and indexing sources cover some journals completely, cover other journals selectively, and omit some journals in their field of interest. The *Science Citation Index* is an exception in that it indexes each and every important entry from any journal it covers. This is one of the major advantages in using the *SCI* as a data base. *Chemical Abstracts* and *Biological Abstracts* have a group of journals which they abstract completely, coupled with a much larger set of journals from which they abstract selectively, based upon the appropriateness of the article to the subject coverage. In some cases the abstractor or indexer may make a quality judgment, based on his estimate of the importance or the quality of the article or upon his

knowledge of whether similar information has appeared elsewhere; Excerpta Medica is a comprehensive abstracting service for which articles are included only if they meet the indexers' quality criteria.

Some data on the extent of coverage of the major secondary sources is presented in Section D of this chapter.

4. Multiple Authorships and Affiliations

Attributing credits for multiple authorships and affiliations is a significant problem in publication and citation analysis. In some scientific papers the authors are listed alphabetically; in others the first author is the primary author; still others use different conventions. These conventions have been been discussed by Crane[1] and by other social scientists.[2] There does not seem to be any reasonable way to deal with the attribution problem, except to attribute a fraction of a publication to each of the authors. For example, an article which has three authors would have one-third of an article attributed to each author. The amount of multiple authorship unfortunately differs from country to country and from field to field. Several studies have investigated the problem, but no comprehensive data exists.[3]

Multiple authorship takes on particular importance when counting an individual's publications since membership on a large research team may lead to a single scientist being a coauthor of ten or more publications per year. This number of publications is far in excess of the normal publication rate of one to two articles per year per scientist.

Multiple authorship problems arise less often in institutional publication counts since there are seldom more than one or two institutions involved in one publication.

A particularly vexing aspect of multiple authorship is the first author citation problem: almost all citations are to the first author in a multi-authored publication. As a result, a researcher who is second author of five papers may receive no

citations under his own name, even though the papers he co-authored may be highly cited. Because of this, a citation count for a person must account for the citations which appear under the names of the first authors of publications for which the author of interest was a secondary author. This can lead to a substantial amount of tedious additional work, since a list of first authors must be generated for all of the subjects' multi-authored papers. Citations to each of these first authors must then be found, the citations of interest noted, and these citations fractionally attributed to the original author. Since multiple years of the Citation Index are often involved, the amount of clerical work searching from volume to volume and from author to author, and citation to citation can be quite large.

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[1] Diana Crane, "Social Structure in a Group of Scientists: A Test of the 'Invisible College' Hypothesis," American Sociological Review 34 (June 1969):335-352.

[2] James E. McCauly, "Multiple Authorship," Science 141 (August 1963):579.

Beverly L. Clark, "Multiple Authorship Trends in Scientific Papers," Science 143 (February 1964):822-824.

[3] Harriet Zuckerman, "Nobel Laureates in Science: Patterns of Productivity, Collaboration, and Authorship," American Sociolgoical Review 32 (June 1967):391-403.

A note of caution about the handling of multiple authorship in the Corporate Index of the Science Citation Index: SCI lists a publication giving all the corporate affiliations, but always with the first author's name. Thus a publication by Jones and Smith where Jones is at Harvard and Smith is at Yale would be listed in the Corporate Index under Harvard with the name Jones and also under Yale with the name Jones. To find the organization with which the various authors are affiliated, the original article must be obtained.

Although the publisher of the Science Citation Index, the Institute for Scientific Information, tries to maintain a consistent policy in attributing institutional affiliations, when authors have multiple affiliations the number of possible variants is large. In the SCI data base on magnetic tape, sufficient information is included to assign a publication with authors from a number of different institutions in a reasonably fair way to those institutions; however, in the printed Corporate Index, one has to refer to the Source Index to find the actual number of authors, or to the paper itself to find the affiliations of each of the authors.

5. Completeness of Available Data

Another consideration in a publication analysis is the completeness of data available in the secondary source, since looking up hundreds or thousands of publications individually is tedious and expensive. One difficulty here is that most of the abstracting and indexing sources are designed for retrieval and not for analysis. As a result, some of the parameters which are of greatest analytical importance, such as the affiliation of the author and his source of financial support, are often omitted. Furthermore, some of the abstracting sources are cross-indexed in complex ways, so that a publication may only be partially described at any one point, and reference must be made to a companion volume to find even such essential data as the author's name. While intellectually trivial, these

searches can be exceedingly time consuming when analyzing large numbers of publications.

The specific data which are consistently available in the secondary sources are the basic bibliographic information: i.e., authors' name, journal or report title, volume, page, etc. This information is the basic data used for retrieval, and since the abstracting and indexing services are retrieval oriented, this bibliographic information is always included.

Data which are less consistently available in the secondary source are the authors' affiliation and the authors' rank or title. Both of these are of interest in analysis. For example, the ranking of universities based on publication in a given subject area is often of interest. This ranking can be tabulated only from a secondary source which gives the authors' university affiliation.

6. Support Acknowledgements

The source of the authors' financial support is seldom given in any secondary source, although it is now being added to the MEDLARS data base. Since this financial data can be used to define the fraction of a subject literature which is being supported by a particular corporate body such as a governmental agency, the data are of substantial evaluative interest.

The amount of acknowledgement of agency support in the scientific literature has changed over time. In a Computer Horizons study completed in 1973 the amount of agency support acknowledgement was tabulated in twenty major journals from five different fields.[4] Table 6-1 summarizes those support acknowledgements for 1969 and 1972.

In 1969, only 67% of the articles in 20 major journals acknowledged financial support. By 1972, the percentage of articles acknowledging financial support had risen to approximately 85%. The table shows that the sources of support differ from one field to another and also shows that the fields of interest to these sources differ as well. For example, the National Science Foundation is the major source of acknowledged support in mathematics, while the National Institutes of Health clearly dominate the support of biology. Chemistry is the field with the largest amount of non-government (private sector) support in the U.S.

Note also that the 20 journals used were major journals in their fields; as less prestigious journals are examined, the amount of support acknowledgement generally decreases.

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[4] Computer Horizons, Inc., Evaluation of Research in the Physical Sciences Based on Publications and Citations, Washington, D.C., National Science Foundation, Contract No. NSF-C627, November, 1973.

TABLE 6-1

AGENCY SUPPORT ACKNOWLEDGEMENTS IN 20 LEADING JOURNALS
FROM 5 MAJOR FIELDS - 1969 and 1972

Agency Acknowledged	Mathematics		Physics		Chemistry		Biochemistry		Biology		All Fields	
	1969	1972	1969	1972	1969	1972	1969	1972	1969	1972	1969	1972
NSF	18%	37%	14%	19%	18%	21%	8%	8%	8%	9%	13%	16%
NIH	2	1	1	1	11	10	37	39	23	32	13	16
AEC	1	1	21	15	10	8	3	2	3	2	11	8
DOD	15	7	19	15	10	10	1	1	2	3	10	9
NASA	1	1	7	9	2	2	1	1	1	2	3	4
Other U.S. Government	1	2	1	2	2	2	1	1	1	3	1	2
Other U.S.	3	10	3	14	8	21	10	10	9	13	7	14
Foreign	5	4	5	15	7	8	16	25	10	24	8	16
Unacknowledged	55	37	31	11	32	18	25	13	42	14	33	15

In an attempt to account for the 15% of unacknowledged papers, a questionnaire was sent to all U.S. authors in the 1972 sample who did not acknowledge agency support. Almost 70% of the authors who had not listed sources of support responded to the questionnaire. Of the authors who responded, over two-thirds were supported by their institutions as part of their regular duties; approximately 20% of the respondents cited specific governmental agencies as sources of support, even though they had not acknowledged these in the article itself. Twelve percent of the respondents listed no agency or institutional support; research done as fulfillment of graduate studies was included in this category.

Overall, the 1972 tabulation and survey showed that 88% of the research reported in these prestigious journals was externally supported, and that 97% of the externally supported work was acknowledged as such.

7. Subject Classification

Having constructed a basic list of publications, the next step in analysis is normally to subject classify the publications. Either the journals or the papers themselves may be classified. When a large number of papers is to be analyzed, classification of the papers by the field of the journal can be very convenient. Such a classification implies, of course, a degree of homogeneity of publication which is normally adequate when analysing hundreds of papers. Such a classification may not be sufficient for the analysis of the scientific publications of one or a few individuals.

Subject classification schemes differ from one abstracting and indexing service to another. Therefore, a comparison of a collection of papers based on the classification schemes of more than one abstracting and indexing service is almost hopeless. A classification of papers at the journal level has been used in the influence methodology discussed in Chapters VII through X.

8. Citation Counts

Citation counts are a tool in evaluative bibliometrics second in importance only to the counting and classification of publications. Citation counts may be used directly as a measure of the utilization or influence of a single publication or of all the publications of an individual, a grant, contract, department, university, funding agency or country. Citation counts may be used to link individuals, institutions, and programs, since they show how one publication relates to another publication.

In addition to these evaluative uses, citations also have important bibliometric uses, since the references from one paper to another define the structure of the scientific literature. Chapter III discusses how this type of analysis may be carried out at a detailed, micro-level to define closely related papers through bibliographic coupling and co-citation. That chapter also describes how citation analysis may be used at a macro-level to link fields and subfields through journal-to-journal mapping. The bibliometric characteristics of the literature also provide a numeric base against which evaluative parameters may be normalized.

Some of the characteristics of the literature which are revealed by citation analysis are noted on Figure 6-1. These characteristics include:

> The dispersion of references: a measure of scientific "hardness", since in fields that are structured and have a central core of accepted knowledge, literature references tend to be quite concentrated.
>
> The concentration of papers and influence: another measure of centrality in a field, dependent upon whether or not a field has a core journal structure.
>
> The hierarchic dependency relationships between field, subfield and journals, including the comparison of numbers of references from field A to field B, compared with number of references from field B to field A: this comparison provides a major justification for the pursuit of basic research as a foundation of knowledge utilized by more applied areas.
>
> The linkages between fields, subfields and journals: a measure of the flow of information, and of the importance of one sector of the scientific mosaic to another.

VII. THE INFLUENCE METHODOLOGY

A. Introduction

In this chapter an influence methodology will be described which allows advanced publication and citation techniques to be applied to institutional aggregates of publications, such as those of departments, schools, programs, support agencies and countries, without performing an individual citation count. In essence, the influence procedure ascribes a weighted average set of properties to a collection of papers, such as the papers in a journal, rather than determining the citation rate for the papers on an individual basis.

The influence methodology is completely general, and can be applied to journals, subfields, fields, institutions or countries.

There are three separate aspects of the influence methodology which are particularly pertinent to journals. These are

1. A subject classification for each journal
2. A research type (level) classification for the biomedical journals, and
3. Citation influence measures for each journal.

It is the third of these, the citation influence measures, which add a quality or utilization aspect to the analysis. The influence methodology assumes that, although citations to papers vary within a given journal, aggregates of publications can be characterized by the influence measures of the journals in which they appear. Chapter IX discusses this assumption in some detail.

Older measures of influence all suffer from some defect which limits their use as evaluative measures.

The total number of publications of an individual, school or country is a measure of total activity only; no inferences concerning importance may be drawn.

The total number of citations to a set of publications, while incorporating a measure of peer group recognition, depends on the size of the set involved and has no meaning on an absolute scale.

The journal "impact factor" introduced by Garfield is a size-independent measure, since it is defined as the ratio of the number of citations the journal receives to the number of publications in a specified earlier time period.[1] This

measure, like the total number of citations, has no meaning on an absolute scale. In addition the impact factor suffers from three more significant limitations. Although the size of the journal, as reflected in the number of publications, is corrected for, the average length of individual papers appearing in the journal is not. Thus, journals which publish longer papers, namely review journals, tend to have higher impact factors. In fact the nine highest impact factors obtained by Garfield were for review journals. This measure can therefore not be used to establish a "pecking order" for journal prestige.

---

[1] Eugene Garfield, "Citation Analysis As a Tool in Journal Evaluation," Science 178 (November 3, 1972):471.

The second limitation is that the citations are unweighted, all citations being counted with equal weight, regardless of the citing journal. It seems more reasonable to give higher weight to a citation from a prestigious journal than to a citation from a peripheral one. The idea of counting a reference from a more prestigious journal more heavily has also been suggested by Kochen.[2]

A third limitation is that there is no normalization for the different referencing characteristics of different segments of the literature: a citation received by a biochemistry journal, in a field noted for its large numbers of references and short citation times, may be quite different in value from a citation in astronomy, where the overall citation density is much lower and the citation time lag much longer.

In this section three related influence measures are developed, each of which measures one aspect of a journal's influence,with explicit recognition of the size factor. These measures are:

(1) The influence weight of the journal: a size-independent measure of the weighted number of citations a journal receives from other journals, normalized by the number of references the journal gives to other journals.

(2) The influence per publication for the journals: the weighted number of citations each article, note or review in a journal receives from other journals.

(3) The total influence of the journal: the influence per publication times the total number of publications.

---

[2] M.Kochen, Principles of Information Retrieval, (New York: John Wiley & Sons, Inc. 1974), 83.

B. Development of the Weighting Scheme

1. The Citation Matrix

A citation matrix may be used to describe the interactions among members of a set of publishing entities. These entities may, for example, be journals, institutions, individuals, fields of research, geographical subdivisions or levels of research methodology. The formalism to be developed is completely general in that it may be applied to any such set. To emphasize this generality, a member of a set will be referred to as a unit rather than as a specific type of unit such as a journal.

The citation matrix is the fundamental entity which contains the information describing the flow of influence among units.

The matrix has the form

$$C = \begin{pmatrix} C_{11} & C_{12} & \cdots & C_{1n} \\ C_{21} & C_{22} & \cdots & C_{2n} \\ \vdots & \vdots & & \vdots \\ C_{n1} & C_{n2} & \cdots & C_{nn} \end{pmatrix} .$$

A distinction is made between the use of the terms "reference" and "citation" depending on whether the issuing or receiving unit is being discussed. Thus, a term C_{ij} in the citation matrix indicates both the number of references unit i gives to unit j and the number of citations unit j receives from unit i.

The time frame of a citation matrix must be clearly understood in order that a measure derived from it be given its proper interpretation. Suppose that the citation data are based on references issued in 1973. The citations received may be to papers in any year up through 1973. In general, the papers issuing the references will not be the same as those receiving the citations. Thus, any conclusions drawn from such a matrix assume an on-going, relatively constant nature for each of the units. For instance, if the units of study are journals, it is assumed that they have not changed in size relative to each other and represent a constant subject area. Journals in rapidly changing fields and new journals would therefore have to be treated with caution.

A citation matrix for a specific time lag may also be formulated. This would link publications in one time period with publications in some specified earlier time period.

2. Influence Weights

For each unit in the set a measure of the influence of that unit will be extracted from the citation matrix. Because total influence is clearly a size-dependent quantity, it is essential to distinguish between a size-independent measure of influence, to be called the influence weight, and the size-dependent total influence.

To make the idea of a size-independent measure more precise, the following property of such a measure may be specified: if a journal were randomly subdivided into smaller entities, each entity would have the same measure as the parent journal.

The citation matrix may be thought of as an "input-output" matrix with the medium of exchange being the citation. Each unit gives out references and receives citations; it is above average if it has a "positive citation balance", i.e., receives more than it gives out. This reasoning provides a first order approximation to the weight of each unit, which is

$$W_i^{(1)} = \frac{\text{total number of citations to the ith unit from other units}}{\text{total number of references from the ith unit to other units}}.$$

This is the starting point for the iterative procedure for the calculation of the influence weights to be described below.

The denominator of this expression is the row sum

$$S_i = \sum_{j=1}^{n} C_{ij}$$

corresponding to the ith unit of the citation matrix; it may be thought of as the "target size" which this unit presents to the referencing world.

The influence weight, W_i, of the ith unit is defined as

$$W_i = \sum_{k=1}^{n} \frac{W_k \; C_{ki}}{S_i}$$

In the sum, the number of cites to the ith unit from the kth unit is weighted by the weight of kth (referencing) unit. The number of cites is also divided by the target size S_i of

the unit i being cited. The n equations, one for each unit, provide a self consistent "bootstrap" set of relations in which each unit plays a role in determining the weight of every other unit. The following summarizes the derivation of those weights.

The equations defining the weights,

$$w_i = \sum_{k=1}^{n} \frac{w_k \quad c_{ki},}{s_i} \qquad i = 1,\ldots,n \qquad (1)$$

are a special case of a more general system of equations which may be written in the form

$$\left\{ \sum_{k=1}^{n} w_k \quad \gamma_{ki} \right\} - \lambda w_i = 0, \qquad i = 1,\ldots,n \quad . \qquad (2)$$

Here $\gamma_{ki} = \frac{c_{ki}}{s_i}$ and Equation 1 is shown to be a special case of Equation 2 corresponding to $\lambda = 1$. As will be explained shortly the system of equations given in (1) will not, in general, possess a non-zero solution; only for certain values of λ called the eigenvalues of the system, will there be non-zero solutions.

With the choice of target size s_i, the value $\lambda = 1$ is in fact an eigenvalue so that Equation 1 itself does possess a solution.

Using the notation γ^T for the transpose of γ,

$\gamma^T_{ik} = \gamma_{ki}$; introducing the Kronecker delta symbol

defined by $\delta_{ik} = \begin{cases} 1 & i = k \\ 0 & i \neq k \end{cases}$

the equation can then be written

$$\sum_{k=1}^{n} \left(\gamma^{T}_{ik} - \lambda\,\delta_{ik}\right) W_k = 0 \; . \qquad (3)$$

This is a system of n homogeneous equations for the weights. In order that a solution for such a system exists, the determinant of the coefficients must vanish. This gives an nth order equation for the eigenvalues

$$\begin{vmatrix} \gamma_{11}-\lambda & \gamma_{21} \; . \; . \; . \; . & \gamma_{n1} \\ \gamma_{12} & \gamma_{22}-\lambda \; . \; . \; . & \gamma_{n2} \\ \vdots & \vdots & \vdots \\ \gamma_{1n} & \gamma_{2n} \; . \; . \; . \; . & \gamma_{nn}-\lambda \end{vmatrix} = 0 \qquad (4)$$

called the characteristic equation.

Only for values of λ which satisfy this equation, does a non-zero solution for the W's exist. Moreover, Equation 3 does not determine the values of the W_k themselves, but at best determines their ratios. Equivalently the eigenvalue equation may be thought of as a vector equation for the vector unknown $\underline{W} = \left\{W_1, \ldots, W_n\right\}$

$$\underline{\underline{\gamma}}^{T} \cdot \underline{W} = \lambda \underline{W} \qquad (5)$$

from which it is clear that only the direction of $\underline{W}$ is determined.

The normalization or scale factor is then fixed by the condition that the size-weighted average of the weights is 1, or

$$\frac{\sum_{1}^{n} s_k \; w_k}{\sum_{1}^{n} s_k} = 1 \qquad (6)$$

This normalization assures that the weight values have an absolute as well as a relative meaning, with the value 1 representing an average value.

Each root of the characteristic equation determines a solution vector or eigenvector of the equation, but the weight vector being sought is the eigenvector corresponding to the largest eigenvalue. This can be seen from the consideration of an alternative procedure for solving the system of equations, a procedure which also leads to the algorithm of choice.

Consider an iterative process starting with equal weights for all units. The values $W_i^{(0)} = 1$ can be thought of as zeroth order approximations to the weights. The first order weights are then

$$W_i^{(1)} = \frac{\sum_{k=1}^{n} c_{ki}}{s_i}$$

This ratio (total cites to a unit divided by the target size of the unit) is the simplest size-corrected citation measure and, in fact, corresponds to the impact measure used by Garfield. These values are then substituted into the right hand side of Equation 1 to obtain the next order of approximation. In general, the mth order approximation is

$$W_i^{(m)} = \sum_{k=1}^{n} \frac{W_k^{(m-1)} C_{ki}}{S_i} = \sum_{k=1}^{n} W_k^{(m-1)} \times \gamma_{ki} = \sum_{j=1}^{n} \left(\gamma\right)^{m}_{ji}$$

The exact weights are therefore

$$W_i = W_i^{(\infty)} = \sum_{j=1}^{n} \left(\lim_{m\to\infty} \gamma^m\right)_{ji}$$

This provides the most convenient numerical procedure for finding the weights, the whole iteration procedure being reduced to successive squarings of the γ matrix.

This procedure is closely related to the standard method for finding the dominant eigenvalue of a matrix. Since $\lambda = 1$ is the largest eigenvalue, repeated squarings are all that is needed. If the largest eigenvalue had a value other than 1, the normalization condition, Equation 6, would have to be reimposed with each squaring. Convergence to three decimal places usually occurs with six squarings,corresponding to raising γ to the 64th power.

APPENDIX G

CONFERENCE ON THE ASSESSMENT OF QUALITY OF GRADUATE EDUCATION PROGRAMS

September 27-29, 1976
Woods Hole, Massachusetts

Participants

Robert A. ALBERTY	Dean of Science, Massachusetts Institute of Technology
Charles ANDERSEN	Coordinator, Education Statistics, American Council on Education
Richard C. ATKINSON	Acting Director, National Science Foundation
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John E. CANTLON	Vice-President for Research and Graduate Studies, Michigan State University
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Monroe D. DONSKER	Professor, Courant Institute of Mathematical Sciences, New York University
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E. Alden DUNHAM	Program Officer, Carnegie Corporation of New York
David A. GOSLIN	Executive Director, Assembly of Behavioral and Social Sciences, National Research Council
Hanna H. GRAY	Provost, Yale University
Norman HACKERMAN	President, Rice University
Philip HANDLER	President, National Academy of Sciences
David D. HENRY	President Emeritus, University of Illinois
Roger W. HEYNS	President, American Council on Education
Lyle V. JONES	Vice Chancellor and Dean, Graduate School, University of North Carolina at Chapel Hill
Charles V. KIDD	Executive Secretary, Association of American Universities
Winfred P. LEHMANN	Professor, Department of Linguistics, University of Texas at Austin
Charles T. LESTER	Vice-President of Arts and Sciences, Emory University

Gardner LINDZEY	Director, Center for Advanced Study in the Behavioral Sciences (Chairman)
Raymond P. MARIELLA	Dean of the Graduate School, Loyola University
Cora B. MARRETT	Center for Advanced Study in the Behavioral Sciences
Peter S. McKINNEY	Acting Dean, Graduate School of Arts and Sciences, Harvard University
Doris H. MERRITT	Dean, Research and Sponsored Programs, Indiana University/Purdue University
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Lincoln E. MOSES	Professor, Department of Family, Community and Preventive Medicine, Stanford University Medical Center
Frederick W. MOTE	Professor, Department of East Asian Studies, Princeton University
Thomas A. NOBLE	Executive Associate, American Council of Learned Societies
J. Boyd PAGE	President, The Council of Graduate Schools in the United States
C. K. N. PATEL	Director, Physical Research Laboratory, Bell Laboratories
Michael J. PELCZAR, Jr.	Vice-President for Graduate Studies and Research, University of Maryland, College Park
Frank PRESS	Chairman, Department of Earth and Planetary Sciences, Massachusetts Institute of Technology
John J. PRUIS	President, Ball State University
Lorene L. ROGERS	President, University of Texas at Austin
John SAWYER	President, The Andrew W. Mellon Foundation
Robert L. SPROULL	President, University of Rochester
Eliot STELLAR	Provost, University of Pennsylvania
Alfred S. SUSSMAN	Dean, Horace H. Rackham School of Graduate Studies, University of Michigan
Donald C. SWAIN	Academic Vice-President, University of California System
Mack E. THOMPSON	Executive Director, American Historical Association
Charles V. WILLIE	Professor of Education and Urban Studies, The Graduate School of Education, Harvard University
H. Edwin YOUNG	Chancellor, University of Wisconsin, Madison
Harriet A. ZUCKERMAN	Associate Professor, Department of Sociology, Columbia University

SUMMARY

September 27-29, 1976, Woods Hole, Massachusetts

Report of the Conference

A substantial majority of the Conference believes that the earlier assessments of graduate education have received wide and important use: by students and their advisors, by the institutions of higher education as aids to planning and the allocation of educational functions, as a check of unwarranted claims of excellence, and in social science research.

The recommendations which follow attempt to distill the main points of consensus within the conference. This report does not in any sense adequately represent the rich diversity of points of view revealed during the Conference nor the deep and real differences in belief among the participants.

Recommendations

1. A new assessment of graduate programs is needed, and we believe that the Conference Board is an appropriate sponsor. While we do not propose to specify the details of this assessment, we are prepared to suggest the following guidelines.

2. The assessment should include a modified replication of the Roose-Andersen study, with the addition of some fields and the subdivision of others.

3. It is important to provide additional indices relevant to program assessment such as some of those cited by Breneman, Drew, and Page. The Conference directs specific attention to the CGS/ETS Study currently nearing completion and urges that the results of that study be carefully examined and used to the fullest possible extent.

4. The initial assessment study should be one of surveying the quality of scholarship and research and the effectiveness of Ph.D. programs in the fields selected for inclusion.

   a. It is intended that the study be carried forward on a continuing basis to provide valuable longitudinal data. This should be implemented along the lines suggested by Moses, involving annual assessment of subsets of programs.

   b. Every eligible institution should be given the choice of whether to be included in the study.

   c. Each program is to be characterized by a set of scores, one for each selected index. The presentation of scores for all

reported indices should be accompanied by a discussion of their substantive meaning. In addition, appropriate measures of uncertainty should accompany all tables of results.

5. We propose a simultaneous study exploring ways of reviewing goals of graduate education other than research and scholarship. This would involve review of other doctoral programs and selected master's programs.

APPENDIX H

PLANNING COMMITTEE FOR THE STUDY OF THE QUALITY OF RESEARCH-DOCTORATE PROGRAMS

September 1978

Robert M. Bock
Dean of the Graduate School
University of Wisconsin
at Madison

Philip E. Converse
Institute for Social Research
University of Michigan

Richard A. Goldsby
Department of Genetics
Stanford University

Hugh Holman
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University of North Carolina
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Lyle V. Jones
Vice Chancellor and Dean,
Graduate School
University of North Carolina
at Chapel Hill

Gardner Lindzey, *Co-Chairman*
Director
Center for Advanced Study in the
Behavioral Sciences
Stanford, California

Sterling McMurrin
Dean of the Graduate School
University of Utah

Lincoln E. Moses
Administrator
Energy Information
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George Pake
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C. K. N. Patel
Director, Physical Research
Bell Laboratories

Cornelius Pings
Dean of the Graduate School
California Institute of
Technology

Gordon Ray
President
The John Simon Guggenheim
Memorial Foundation

Harriet A. Zuckerman,
Co-Chairman
Department of Sociology
Columbia University

APPENDIX I

REGION AND STATE CODES
FOR THE UNITED STATES AND POSSESSIONS
(and U.S. Government)

REGION 1 - NEW ENGLAND

11	Maine
12	New Hampshire
13	Vermont
14	Massachusetts
15	Rhode Island
16	Connecticut

REGION 2 - MIDDLE ATLANTIC

21	New York
22	New Jersey
23	Pennsylvania

REGION 3 - EAST NORTH CENTRAL

31	Ohio
32	Indiana
33	Illinois
34	Michigan
35	Wisconsin

REGION 4 - WEST NORTH CENTRAL

41	Minnesota
42	Iowa
43	Missouri
44	North Dakota
45	South Dakota
46	Nebraska
47	Kansas

REGION 5 - SOUTH ATLANTIC

51	Delaware
52	Maryland
53	District of Columbia
54	Virginia
55	West Virginia
56	North Carolina
57	South Carolina
58	Georgia
59	Florida

REGION 6 - EAST SOUTH CENTRAL

61	Kentucky
62	Tennessee
63	Alabama
64	Mississippi

REGION 7 - WEST SOUTH CENTRAL

71	Arkansas
72	Louisiana
73	Oklahoma
74	Texas

REGION 8 - MOUNTAIN

81	Montana
82	Idaho
83	Wyoming
84	Colorado
85	New Mexico
86	Arizona
87	Utah
88	Nevada

REGION 9 - PACIFIC

90	Guam
91	Washington
92	Oregon
93	California
94	Alaska
95	Hawaii
96	Virgin Islands
97	Panama Canal Zone
98	Puerto Rico

R6000-14-5

An Assessment of Research-Doctorate Programs in the United States:

Social & Behavioral Sciences

Committee on an Assessment of Quality-Related Characteristics
of Research-Doctorate Programs in the United States

Lyle V. Jones, Gardner Lindzey, and
Porter E. Coggeshall, *Editors*

Sponsored by

The Conference Board of Associated Research Councils

American Council of Learned Societies
American Council on Education
National Research Council
Social Science Research Council

NATIONAL ACADEMY PRESS
Washington, D.C. 1982

NOTICE: The project that is the subject of this report was approved by the Conference Board of Associated Research Councils, whose members are drawn from the American Council of Learned Societies, the American Council on Education, the National Research Council, and the Social Science Research Council. The members of the committee responsible for the report were chosen for their special competences and with regard for appropriate balance.

This report has been reviewed by a group other than the authors and editors according to procedures approved by each of the four member Councils of the Conference Board.

The Conference Board of Associated Research Councils was created to foster discussion of issues of mutual interest; to determine the extent to which a common viewpoint on such issues prevails within the academic community of the United States; to foster specific investigations when so desired; and, when the Conference Board finds joint, common, or other action desirable, to make recommendations to the appropriate Councils.

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The committee is most appreciative of the cooperation it received from individuals in the 228 universities participating in the assessment. In particular we thank the university presidents and chancellors who agreed to participate and offered the assistance of staff members at their institutions; the graduate deans, department chairmen, and many other university personnel who helped to compile information about the research-doctorate programs at their own institutions; and the nearly 5,000 faculty members who took the time to complete and return reputational survey forms. This assessment would not have been feasible without the participation of these individuals. Nor would it have been complete without the suggestions from many individuals within and outside the academic community who reviewed the study plans and committee reports.

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Within the National Research Council many individuals have assisted in the planning and completion of this project. Robert A. Alberty, Harrison Shull, and W. K. Estes, former chairmen of the Commission on Human Resources, and William C. Kelly, Executive Director of the commission (now the Office of Scientific and Engineering Personnel), offered assistance and helpful counsel during all phases of the study. Lindsey R. Harmon and C. Alan Boneau contributed greatly to the planning of the assessment.

To Porter E. Coggeshall, Study Director, the committee expresses thanks for a job extremely well done. His ability to translate the committee's directions into compiled data and analyses must be given a large share of the credit for the completion of this project. He has been ably assisted by Prudence W. Brown, who supervised the data collection activities; Dorothy G. Cooper, who provided excellent secretarial support; George A. Boyce, whose programming expertise was invaluable; and Kathleen Drennan and Linda Dix, who helped in preparing final copy of the manuscript.

Committee on an Assessment of Quality-Related
Characteristics of Research-Doctorate Programs
in the United States

Preface

The genius of American higher education is often said to be in the close association of training and research--that is, in the nation's research-doctorate programs. Consequently, we are not surprised at the amount of worried talk about the quality of the research doctorate, for deterioration at that level will inevitably spread to wherever research skills are needed--and that indeed is a far-flung network of laboratories, institutes, firms, agencies, bureaus, and departments. What might surprise us, however, is the imbalance between the putative national importance of research-doctorate programs and the amount of sustained evaluative attention they themselves receive.

The present assessment, sponsored by the Conference Board of Associated Research Councils--comprised of the American Council of Learned Societies, the American Council on Education, the National Research Council (NRC), and the Social Science Research Council--seeks to correct the imbalance between worried talk and systematic study. In this effort the Conference Board continues a tradition pioneered by the American Council on Education, which in 1966 published An Assessment of Quality in Graduate Education, the report of a study conducted by Allan M. Cartter, and in 1970 published A Rating of Graduate Programs, by Kenneth D. Roose and Charles J. Andersen. The Cartter and Roose-Andersen reports have been widely used and frequently cited.

Some years after the release of the Roose-Andersen report, it was decided that the effort to assess the quality of research-doctorate programs should be renewed, and the Conference Board of Associated Research Councils agreed to sponsor an assessment. The Board of Directors of the American Council on Education concurred with the notion that the next study should be issued under these broader auspices. The NRC agreed to serve as secretariat for a new study. The responsible staff of the NRC earned the appreciation of the Conference Board for the skill and dedication shown during the course of securing funding and implementing the study. Special mention should also be made of the financial contribution of the National Academy of Sciences which, by supplementing funds available from external sources, made it possible for the study to get under way.

To sponsor a study comparing the quality of programs in 32 disciplines and from more than 200 doctorate-granting universities is to invite critics, friendly and otherwise. Such was the fate of the previous studies; such has been the fate of the present study. Scholarship, fortunately, can put criticism to creative use and has done so in this project. The study committee appointed by the Conference Board reviewed the criticisms of earlier efforts to assess research-doctorate programs, and it actively solicited criticisms and suggestions for improvements of its own design. Although constrained by limited funds, the committee applied state-of-the-art methodology in a design that incorporated the lessons learned from previous studies as well as attending to many critics of the present effort. Not all criticism has thus been stilled; nor could it ever be. Additional criticisms will be voiced by as many persons as begin to use the results of this effort in ways not anticipated by its authors. These criticisms will be welcome. The Conference Board believes that the present study, building on earlier criticisms and adopting a multidimensional approach to the assessment of research-doctorate programs, represents a substantial improvement over past reports. Nevertheless, each of the diverse measures used here has its own limitations, and none provides a precise index of the quality of a program for educating students for careers in research. No doubt a future study, taking into account the weaknesses as well as strengths of this effort, will represent still further improvement. One mark of success for the present study would be for it to take its place in a continuing series, thereby contributing to the indicator base necessary for informed policies that will maintain and perhaps enhance the quality of the nation's research-doctorate programs.

For the more immediate future the purposes of this assessment are to assist students and student advisers seeking the best match possible between individual career goals and the choice of an advanced degree program; to serve scholars whose study site is higher education and the nation's research enterprise; and to inform the practical judgment of the administrators, funders, and policymakers responsible for protecting the quality of scholarly education in the United States.

A remarkably hard-working and competent group, whose names appear on page vii of this report, oversaw the long process by which this study moved from the planning stage to the completion of these reports. The Conference Board expresses its warmest thanks to the members of its committee and especially to their co-chairmen, Lyle V. Jones and Gardner Lindzey.

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Research Councils

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I

Origins of Study and Selection of Programs

Each year more than 22,000 candidates are awarded doctorates in engineering, the humanities, and the sciences from approximately 250 U.S. universities. They have spent, on the average, five-and-a-half years in intensive education and research in preparation for careers either in universities or in settings outside the academic sector, and many will make significant contributions to research. Yet we are poorly informed concerning the quality of the programs producing these graduates. This study is intended to provide information pertinent to this complex and controversial subject.

The charge to the study committee directed it to build upon the planning that preceded it. The planning stages included a detailed review of the methodologies and the results of past studies that had focused on the assessment of doctoral-level programs. The committee has taken into consideration the reactions of various groups and individuals to those studies. The present assessment draws upon previous experience with program evaluation, with the aim of improving what was useful and avoiding some of the difficulties encountered in past studies. The present study, nevertheless, is not purely reactive: it has its own distinctive features. First, it focuses only on programs awarding research doctorates and their effectiveness in preparing students for careers in research. Although other purposes of graduate education are acknowledged to be important, they are outside the scope of this assessment. Second, the study examines a variety of different indices that may be relevant to the program quality. This multidimensional approach represents an explicit recognition of the limitations of studies that rely entirely on peer ratings of perceived quality--the so-called reputational ratings. Finally, in the compilation of reputational ratings in this study, evaluators were provided the names of faculty members involved with each program to be rated and the number of research doctorates awarded in the last five years. In previous reputational studies evaluators were not supplied such information.

During the past two decades increasing attention has been given to describing and measuring the quality of programs in graduate education. It is evident that the assessment of graduate programs is highly important for university administrators and faculty, for employers in industrial and government laboratories, for graduate students and prospective graduate students, for policymakers in state and national organizations, and for private and public funding agencies. Past experience, however, has demonstrated the difficulties with such assessments and their potentially controversial nature. As one critic has asserted:

> . . . the overall *effect* of these reports seems quite clear. They tend, first, to make the rich richer and the poor poorer; second, the example of the highly ranked clearly imposes constraints on those institutions lower down the scale (the "Hertz-Avis" effect). And the effect of such constraints is to reduce diversity, to reward conformity or respectability, to penalize genuine experiment or risk. There is, also, I believe, an obvious tendency to promote the prevalence of disciplinary dogma and orthodoxy. All of this might be tolerable if the reports were tolerably accurate and judicious, if they were less *prescriptive* and more *descriptive*; if they did not pretend to "objectivity" and if the very fact of ranking were not pernicious and invidious; if they genuinely promoted a meaningful "meritocracy" (instead of simply perpetuating the *status quo ante* and an establishment mentality). But this is precisely what they cannot claim to be or do.[1]

The widespread criticisms of ratings in graduate education were carefully considered in the planning of this study. At the outset consideration was given to whether a national assessment of graduate programs should be undertaken at this time and, if so, what methods should be employed. The next two sections in this chapter examine the background and rationale for the decision by the Conference Board of Associated Research Councils[2] to embark on such a study. The remainder of the chapter describes the selection of disciplines and programs to be covered in the assessment.

The overall study encompasses a total of 2,699 graduate programs in 32 disciplines. In this report--the fifth and final report issuing from the study--we examine 639 programs in seven disciplines in the social and behavioral sciences: anthropology, economics, geography, history, political science, psychology, and sociology. These programs account for more than 90 percent of the research doctorates awarded in these seven disciplines. It should be emphasized that the selection of disciplines to be covered was determined on the basis of total doctoral awards during the FY1976-78 period (as described later in this chapter), and the exclusion of a particular discipline was in no way based on a judgment of the importance of graduate education or research in that discipline. Also, although the assessment is limited to programs leading to the research-doctorate (Ph.D. or equivalent) degree, the Conference Board and study committee recognize that graduate schools provide many other forms of valuable and needed education.

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[1] William A. Arrowsmith, "Preface" in *The Ranking Game: The Power of the Academic Elite*, by W. Patrick Dolan, University of Nebraska Printing and Duplicating Service, Lincoln, Nebraska, 1976, p. ix.

[2] The Conference Board includes representatives of the American Council of Learned Societies, American Council on Education, National Research Council, and Social Science Research Council.

PRIOR ATTEMPTS TO ASSESS QUALITY IN GRADUATE EDUCATION

Universities and affiliated organizations have taken the lead in the review of programs in graduate education. At most institutions program reviews are carried out on a regular basis and include a comprehensive examination of the curriculum and educational resources as well as the qualifications of faculty and students. One special form of evaluation is that associated with institutional accreditation:

> The process begins with the institutional or programmatic self-study, a comprehensive effort to measure progress according to previously accepted objectives. The self-study considers the interest of a broad cross-section of constituencies--students, faculty, administrators, alumni, trustees, and in some circumstances the local community. The resulting report is reviewed by the appropriate accrediting commission and serves as the basis for evaluation by a site-visit team from the accrediting group. . . . Public as well as educational needs must be served simultaneously in determining and fostering standards of quality and integrity in the institutions and such specialized programs as they offer. Accreditation, conducted through nongovernmental institutional and specialized agencies, provides a major means for meeting those needs.[3]

Although formal accreditation procedures play an important role in higher education, many university administrators do not view such procedures as an adequate means of assessing program quality. Other efforts are being made by universities to evaluate their programs in graduate education. The Educational Testing Service, with the sponsorship of the Council of Graduate Schools in the United States and the Graduate Record Examinations Board, has recently developed a set of procedures to assist institutions in evaluating their own graduate programs.[4]

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[3] Council on Postsecondary Accreditation, The Balance Wheel for Accreditation, Washington, D.C., July 1981, pp. 2-3.

[4] For a description of these procedures, see M. J. Clark, Graduate Program Self-Assessment Service: Handbook for Users, Educational Testing Service, Princeton, New Jersey, 1980.

While reviews at the institutional (or state) level have proven useful in assessing the relative strengths and weaknesses of individual programs, they have not provided the information required for making national comparisons of graduate programs. Several attempts have been made at such comparisons. The most widely used of these have been the studies by Keniston (1959), Cartter (1966), and Roose and Andersen (1970). All three studies covered a broad range of disciplines in engineering, the humanities, and the sciences and were based on the opinions of knowledgeable individuals in the program areas covered. Keniston[5] surveyed the department chairmen at 25 leading institutions. The Cartter[6] and Roose-Andersen[7] studies compiled ratings from much larger groups of faculty peers. The stated motivation for these studies was to increase knowledge concerning the quality of graduate education:

> A number of reasons can be advanced for undertaking such a study. The diversity of the American system of higher education has properly been regarded by both the professional educator and the layman as a great source of strength, since it permits flexibility and adaptability and encourages experimentation and competing solutions to common problems. Yet diversity also poses problems. . . . Diversity can be a costly luxury if it is accompanied by ignorance. . . . Just as consumer knowledge and honest advertising are requisite if a competitive economy is to work satisfactorily, so an improved knowledge of opportunities and of quality is desirable if a diverse educational system is to work effectively.[8]

Although the program ratings from the Cartter and Roose-Andersen studies are highly correlated, some substantial differences in successive ratings can be detected for a small number of programs--suggesting changes in the programs or in the perception of the programs. For the past decade the Roose-Andersen ratings have generally been regarded as the best available source of information on the quality of doctoral programs. Although the ratings are now more than 10 years out of date and have been criticized on a variety of grounds, they are still used extensively by individuals within the academic community and by those in federal and state agencies.

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[5] H. Keniston, Graduate Study in Research in the Arts and Sciences at the University of Pennsylvania, University of Pennsylvania Press, Philadelphia, 1959.

[6] A. M. Cartter, An Assessment of Quality in Graduate Education, American Council on Education, Washington, D.C., 1966.

[7] K. D. Roose and C. J. Andersen, A Rating of Graduate Programs, American Council on Education, Washington, D.C., 1970.

[8] Cartter, p. 3.

A frequently cited criticism of the Cartter and Roose-Andersen studies is their exclusive reliance upon reputational measurement.

> The ACE rankings are but a small part of all the evaluative processes, but they are also the most public, and they are clearly based on the narrow assumptions and elitist structures that so dominate the present direction of higher education in the United States. As long as our most prestigious source of information about postsecondary education is a vague popularity contest, the resultant ignorance will continue to provide a cover for the repetitious aping of a single model. . . . All the attempts to change higher education will ultimately be strangled by the "legitimate" evaluative processes that have already programmed a single set of responses from the start.[9]

A number of other criticisms have been leveled at reputational rankings of graduate programs.[10] First, such studies inherently reflect perceptions that may be several years out of date and do not take into account recent changes in a program. Second, the ratings of individual programs are likely to be influenced by the overall reputation of the university--i.e., an institutional "halo effect." Also, a disproportionately large fraction of the evaluators are graduates of and/or faculty members in the largest programs, which may bias the survey results. Finally, on the basis of such studies it may not be possible to differentiate among many of the lesser known programs in which relatively few faculty members have established national reputations in research.

Despite such criticisms several studies based on methodologies similar to that employed by Cartter and Roose and Andersen have been carried out during the past 10 years. Some of these studies evaluated post-baccalaureate programs in areas not covered in the two earlier reports--including business, religion, educational administration, and medicine. Others have focused exclusively on programs in particular disciplines within the sciences and humanities. A few attempts have been made to assess graduate programs in a broad range of disciplines, many of which were covered in the Roose-Andersen and Cartter ratings, but in the opinion of many each has serious deficiencies in the methods and procedures employed. In addition to such studies, a myriad of articles have been written on the assessment of graduate programs since the release of the Roose-Andersen report. With the heightening interest in these evaluations, many in the academic community have recognized the need to assess graduate programs, using other criteria in addition to peer judgment.

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[9] Dolan, p. 81.

[10] For a discussion of these criticisms, see David S. Webster, "Methods of Assessing Quality," Change, October 1981, pp. 20-24.

> Though carefully done and useful in a number of ways, these ratings (Cartter and Roose-Andersen) have been criticized for their failure to reflect the complexity of graduate programs, their tendency to emphasize the traditional values that are highly related to program size and wealth, and their lack of timeliness or currency. Rather than repeat such ratings, many members of the graduate community have voiced a preference for developing ways to assess the quality of graduate programs that would be more comprehensive, sensitive to the different program purposes, and appropriate for use at any time by individual departments or universities.[11]

Several attempts have been made to go beyond the reputational assessment. Clark, Harnett, and Baird, in a pilot study[12] of graduate programs in chemistry, history, and psychology, identified as many as 30 possible measures significant for assessing the quality of graduate education. Glower[13] has ranked engineering schools according to the total amount of research spending and the number of graduates listed in Who's Who in Engineering. House and Yeager[14] rated economics departments on the basis of the total number of pages published by full professors in 45 leading journals in this discipline. Other ratings based on faculty publication records have been compiled for graduate programs in a variety of disciplines, including political science, psychology, and sociology. These and other studies demonstrate the feasibility of a national assessment of graduate programs that is founded on more than reputational standing among faculty peers.

DEVELOPMENT OF STUDY PLANS

In September 1976 the Conference Board, with support from the Carnegie Corporation of New York and the Andrew W. Mellon Foundation, convened a three-day meeting to consider whether a study of programs in graduate education should be undertaken. The 40 invited participants in this meeting included academic administrators, faculty members, and agency and foundation officials[15] and represented a variety of institutions, disciplines, and convictions. In these discussions there was considerable debate concerning whether the potential benefits of such a study outweighed the possible misrepresentations of the results. On the one hand, "a substantial majority of the Conference [participants believed] that the earlier assessments of graduate education have received wide and important use: by students and their advisors, by the institutions of higher education as aids to planning and the allocation of educational functions, as a check on unwarranted claims of excellence, and in social science research."[16] On the other hand, the Conference participants recognized that a new study assessing the quality of graduate education "would be conducted and received in a very different atmosphere than were the earlier Cartter and Roose-Andersen reports. . . . Where ratings were previously used in deciding where to increase funds and how to balance expanding programs, they might now be used in deciding where to cut off funds and programs."

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[11] Clark, p. 1.

[12] M. J. Clark, R. T. Harnett, and L. L. Baird, Assessing Dimensions of Quality in Doctoral Education: A Technical Report of a National Study in Three Fields, Educational Testing Service, Princeton, New Jersey, 1976.

[13] Donald D. Glower, "A Rational Method for Ranking Engineering Programs," Engineering Education, May 1980.

[14] Donald R. House and James H. Yeager, Jr., "The Distribution of Publication Success Within and Among Top Economics Departments: A Disaggregate View of Recent Evidence," Economic Inquiry, Vol. 16, No. 4, October 1978, pp. 593-598.

After an extended debate of these issues, it was the recommendation of this conference that a study with particular emphasis on the effectiveness of doctoral programs in educating research personnel be undertaken. The recommendation was based principally on four considerations:

(1) the importance of the study results to national and state bodies,
(2) the desire to stimulate continuing emphasis on quality in graduate education,
(3) the need for current evaluations that take into account the many changes that have occurred in programs since the Roose-Andersen study, and
(4) the value of extending the range of measures used in evaluative studies of graduate programs.

Although many participants expressed interest in an assessment of master's degree and professional degree programs, insurmountable problems prohibited the inclusion of these types of programs in this study.

Following this meeting a 13-member committee,[17] co-chaired by Gardner Lindzey and Harriet A. Zuckerman, was formed to develop a detailed plan for a study limited to research-doctorate programs and designed to improve upon the methodologies utilized in earlier studies. In its deliberations the planning committee carefully considered the criticisms of the Roose-Andersen study and other national assessments. Particular attention was paid to the feasibility of compiling a variety of specific measures (e.g., faculty publication records, quality of students, program resources) that were judged to be related to the quality of research-doctorate programs. Attention was also given to making improvements in the survey instrument and procedures used in the

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[15] See Appendix G for a list of the participants in this conference.
[16] From a summary of the Woods Hole Conference (see Appendix G).
[17] See Appendix H for a list of members of the planning committee.

Cartter and Roose-Andersen studies. In September 1978 the planning group submitted a comprehensive report describing alternative strategies for an evaluation of the quality and effectiveness of research-doctorate programs.

> The proposed study has its own distinctive features. It is characterized by a sharp focus and a multidimensional approach. (1) It will focus only on programs awarding research doctorates; other purposes of doctoral training are acknowledged to be important, but they are outside the scope of the work contemplated. (2) The multidimensional approach represents an explicit recognition of the limitations of studies that make assessments solely in terms of ratings of perceived quality provided by peers--the so-called reputational ratings. Consequently, a variety of quality-related measures will be employed in the proposed study and will be incorporated in the presentation of the results of the study.[18]

This report formed the basis for the decision by the Conference Board to embark on a national assessment of doctorate-level programs in the sciences, engineering, and the humanities.

In June 1980 an 18-member committee was appointed to oversee the study. The committee,[19] made up of individuals from a diverse set of disciplines within the sciences, engineering, and the humanities, includes seven members who had been involved in the planning phase and several members who presently serve or have served as graduate deans in either public or private universities. During the first eight months the committee met three times to review plans for the study activities, make decisions on the selection of disciplines and programs to be covered, and design the survey instruments to be used. Early in the study an effort was made to solicit the views of presidents and graduate deans at more than 250 universities. Their suggestions were most helpful to the committee in drawing up final plans for the assessment. With the assistance of the Council of Graduate Schools in the United States, the committee and its staff have tried to keep the graduate deans informed about the progress being made in this study. The final section of this chapter describes the procedures followed in determining which research-doctorate programs were to be included in the assessment.

SELECTION OF DISCIPLINES AND PROGRAMS TO BE EVALUATED

One of the most difficult decisions made by the study committee was the selection of disciplines to be covered in the assessment. Early in the planning stage it was recognized that some important areas of graduate education would have to be left out of the study. Limited financial resources required that efforts be concentrated on a total of no more than about 30 disciplines in the biological sciences, engineering, humanities, mathematical and physical sciences, and social and behavioral sciences. At its initial meeting the committee decided that the selection of disciplines within each of these five areas should be made primarily on the basis of the total number of doctorates awarded nationally in recent years.

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[18] National Research Council, A Plan to Study the Quality and Effectiveness of Research-Doctorate Programs, 1978 (unpublished report).

[19] See p. vii for a list of members of the study committee.

At the time the study was undertaken, aggregate counts of doctoral degrees earned during the FY1976-78 period were available from two independent sources--the Educational Testing Service (ETS) and the National Research Council (NRC). Table 1.1 presents doctoral awards data for 10 disciplines within the social and behavioral sciences. As alluded to in footnote 1 of the table, discrepancies between the ETS and NRC counts may be explained, in part, by differences in the data collection procedures. The ETS counts, derived from information provided by universities, have been categorized according to the discipline of the department/academic unit in which the degree was earned. The NRC counts were tabulated from the survey responses of FY1976-78 Ph.D. recipients, who had been asked to identify their fields of specialty. Originally the committee had decided to include only the first six social and behavioral science disciplines listed in Table 1.1. However, at the urging of many individuals in the academic community and at the request of the National Science Foundation, which provided supplemental funding, geography[20] was added to the list of social and behavioral science disciplines to be covered in the assessment. Since the decision to include geography was not made until spring 1981, the survey of evaluators in this discipline was not undertaken until five months after the survey in other disciplines.

The selection of the research-doctorate programs to be evaluated in each discipline was made in two stages. Programs meeting either of the following criteria[21] were initially nominated for inclusion in the study:

(1) more than a specified number (see below) of research doctorates awarded during the FY1976-78 period or
(2) more than one-third of that specified number of doctorates awarded in FY1979.

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[20] Geography was among the disciplines covered in the Roose-Andersen study.

[21] In the first three volumes of the committee's study, which pertain to the mathematical and physical sciences, humanities, and engineering, it is mistakenly reported that a third criterion based on results from the Roose-Andersen study was used in the nomination of programs to be included in the assessment. This third criterion, while at one time considered by the committee, was not adopted.

TABLE 1.1 Number of Research-Doctorates Awarded in Social and Behavioral Science Disciplines, FY1976-78

	Source of Data*	
	ETS	NRC
Disciplines Included in the Assessment		
Psychology	6,977	8,868
History	2,511	2,819
Economics	2,323	2,524
Political Science	2,021	2,195
Sociology	1,981	2,069
Anthropology	1,252	1,290
Geography	523	469
Total	17,588	20,234
Disciplines Not Included in the Assessment		
Area Studies	479	333
Public Administration	413	423
Urban Studies	62	247
Other Social and Behavioral Sciences	N/A	694
Total		1,697

*Data on FY1976-78 doctoral awards were derived from two independent sources: Educational Testing Service (ETS), Graduate Programs and Admissions Manual, 1979-81, and the NRC's Survey of Earned Doctorates, 1976-78. Differences in field definitions account for discrepancies between the ETS and NRC data.

In each discipline the specified number of doctorates required for inclusion in the study was determined in such a way that the programs meeting this criterion accounted for at least 90 percent of the doctorates awarded in that discipline during the FY1976-78 period. In the social and behavioral science disciplines the following numbers of FY1976-78 doctoral awards were required to satisfy the first criterion (above):

Anthropology--9 or more doctorates
Economics--12 or more doctorates
Geography--1 or more doctorates
History--11 or more doctorates
Political Science--10 or more doctorates
Psychology--22 or more doctorates
Sociology--9 or more doctorates.

A list of the nominated programs at each institution was then sent to a designated individual (usually the graduate dean) who had been appointed by the university president to serve as study coordinator for the institution. The coordinator was asked to review the list and eliminate any programs no longer offering research doctorates or not belonging in the designated discipline. The coordinator also was given an opportunity to nominate additional programs that he or she believed should be included in the study.[22] Coordinators were asked to restrict their nominations to programs that they considered to be "of uncommon distinction" and that had awarded no fewer than two research-doctorates during the past two years. In order to be eligible for inclusion, of course, programs had to belong in one of the disciplines covered in the study. If the university offered more than one research-doctorate program in a discipline, the coordinator was instructed to provide information on each of them so that these programs could be evaluated separately.

The committee received excellent cooperation from the study coordinators at universities. Of the 243 institutions that were identified as having one or more research-doctorate programs satisfying the criteria (listed earlier) for inclusion in the study, only 7 declined to participate in the study and another 8 failed to provide the program information requested within the three-month period allotted (despite several reminders). None of these 15 institutions had doctoral programs that had received strong or distinguished reputational ratings in prior national studies. Since the information requested had not been provided, the committee decided not to include programs from these institutions in any aspect of the assessment. In each of the seven chapters that follows, a list is given of the universities that met the criteria for inclusion in a particular discipline but that are not represented in the study.

As a result of nominations by institutional coordinators, some programs were added to the original list and others dropped. Table 1.2 reports the final coverage in each of the seven social and behavioral science disciplines. The number of programs evaluated varies considerably by discipline. A total of 150 psychology programs have been included in the study; in geography and anthropology fewer than half this number have been included. Although the final determination of whether a program should be included in the assessment was left in the hands of the institutional coordinator, it is entirely possible that a few programs meeting the criteria for inclusion in the assessment were overlooked by the coordinators. In the chapter that follows, a detailed description is given of each of the measures used in the evaluation of research-doctorate programs in the social and behavioral sciences. The description includes a discussion of the rationale for using the measure, the source from which data for that measure were derived, and any known limitations that would affect the interpretation of the data reported. The committee wishes to emphasize that there are limitations associated with each of the measures and that none of the measures should be regarded as a precise indicator of the quality of a program in educating scientists for careers in research. The reader is strongly urged to consider the descriptive material presented in Chapter II before attempting to interpret the program evaluations reported in subsequent chapters. In presenting a frank discussion of any shortcomings of each measure, the committee's intent is to reduce the possibility of misuse of the results from this assessment of research-doctorate programs.

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[22] See Appendix A for the specific instructions given to the coordinators.

TABLE 1.2 Number of Programs Evaluated in Each Discipline and the Total FY1976-80 Doctoral Awards from These Programs

Discipline	Programs	FY1976-80 Doctorates*
Anthropology	70	1,960
Economics	93	3,770
Geography	49	762
History	102	3,877
Political Science	83	2,909
Psychology	150	10,582
Sociology	92	3,061
TOTAL	639	26,921

*The data on doctoral awards were provided by the study coordinator at each of the universities covered in the assessment.

II

Methodology

> Quality . . . you know what it is, yet you don't know what it is. But that's self-contradictory. But some things are better than others, that is, they have more quality. But when you try to say what the quality is, apart from the things that have it, it all goes poof! There's nothing to talk about. But if you can't say what Quality is, how do you know what it is, or how do you know that it even exists? If no one knows what it is, then for all practical purposes it doesn't exist at all. But for all practical purposes it really does exist. What else are the grades based on? Why else would people pay fortunes for some things and throw others in the trash pile? Obviously some things are better than others . . . but what's the "betterness"? . . . So round and round you go, spinning mental wheels and nowhere finding anyplace to get traction. What the hell is Quality? What is it?
>
> Robert M. Pirsig
> Zen and the Art of
> Motorcycle Maintenance

Both the planning committee and our own study committee have given careful consideration to the types of measures to be employed in the assessment of research-doctorate programs.[1] The committees recognized that any of the measures that might be used is open to criticism and that no single measure could be expected to provide an entirely satisfactory index of the quality of graduate education. With respect to the use of multiple criteria in educational assessment, one critic has commented:

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[1] A description of the measures considered may be found in the third chapter of the planning committee's report, along with a discussion of the relative merits of each measure.

> At best each is a partial measure encompassing a fraction of the large concept. On occasion its link to the real [world] is problematic and tenuous. Moreover, each measure [may contain] a load of irrelevant superfluities, "extra baggage" unrelated to the outcomes under study. By the use of a number of such measures, each contributing a different facet of information, we can limit the effect of irrelevancies and develop a more rounded and truer picture of program outcomes.[2]

Although the use of multiple measures alleviates the criticisms directed at a single dimension or measure, it certainly will not satisfy those who believe that the quality of graduate programs cannot be represented by quantitative estimates no matter how many dimensions they may be intended to represent. Furthermore, the usefulness of the assessment is dependent on the validity and reliability of the criteria on which programs are evaluated. The decision concerning which measures to adopt in the study was made primarily on the basis of two factors:

(1) the extent to which a measure was judged to be related to the quality of research-doctorate programs and
(2) the feasibility of compiling reliable data for making national comparisons of programs in particular disciplines.

Only measures that were applicable to a majority of the disciplines to be covered were considered. In reaching a final decision the study committee found the ETS study,[3] in which 27 separate variables were examined, especially helpful, even though it was recognized that many of the measures feasible in institutional self-studies would not be available in a national study. The committee was aided by the many suggestions received from university administrators and others within the academic community.

Although the initial design called for an assessment based on approximately six measures, the committee concluded that it would be highly desirable to expand this effort. A total of 16 measures (listed in Table 2.1) have been utilized in the assessment of research-doctorate programs in economics, political science, psychology, and sociol-

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[2] C. H. Weiss, Evaluation Research: Methods of Assessing Program Effectiveness, Prentice-Hall, Inc., Englewood Cliffs, New Jersey, 1972, p. 56.

[3] See M. J. Clark et al. (1976) for a description of these variables.

R6000-14.5

This page is a duplicate of Table 2.1 and may be used as a guide to program measures by placing it beside the tables under examination.

MEASURES COMPILED ON INDIVIDUAL RESEARCH-DOCTORATE PROGRAMS IN THE SOCIAL AND BEHAVIORAL SCIENCES

Program Size[1] (See page 17.)

01 Reported number of faculty members in the program, December 1980.

02 Reported number of program graduates in last five years (July 1975 through June 1980).

03 Reported total number of full-time and part-time graduate students enrolled in the program who intend to earn doctorates, December 1980.

Characteristics of Graduates[2] (See pages 17-20.)

04 Fraction of FY1975-79 program graduates who had received some national fellowship or training grant support during their graduate education.

05 Median number of years from first enrollment in graduate school to receipt of the doctorate--FY1975-79 program graduates.[3]

06 Fraction of FY1975-79 program graduates who at the time they completed requirements for the doctorate reported that they had made definite commitments for postgraduation employment.

07 Fraction of FY1975-79 program graduates who at the time they completed requirements for the doctorate reported that they had made definite commitments for postgraduation employment in Ph.D.-granting universities.

Reputational Survey Results[4] (See pages 20-26.)

08 Mean rating of the scholarly quality of program faculty (scale = 0 to 5).

09 Mean rating of the effectiveness of the program in educating research scholars/scientists (scale = 0 to 3).

10 Mean rating of the improvement in program quality in the last five years (scale = 0 to 2).

11 Mean rating of the evaluators' familiarity with the work of the program's faculty (scale = 0 to 2).

University Library Size[5] (See page 25-26.)

12 Composite index describing the library size in the university in which the program is located, 1979-80 (scale = -3 to +3).

Research Support (See pages 26-27.)

13 Fraction of program faculty members holding research grants from the Alcohol, Drug Abuse, and Mental Health Administration, the National Institutes of Health, or the National Science Foundation at any time during the FY1978-80 period.[6]

14 Total expenditures reported by the university for research and development activities in a specified field, FY1979[7] (in thousands of dollars).

Publication Records[8] (See pages 27-29.)

17 Number of published articles attributed to the program faculty members, 1978-80.

18 Fraction of program faculty members with one or more published articles, 1978-80.

[1] Based on information provided to the committee by the participating universities.

[2] Based on data compiled in the NRC's Survey of Earned Doctorates.

[3] In reporting standardized scores and correlations with other variables, a shorter time-to-Ph.D. is assigned a higher score.

[4] Based on responses to the committee's survey conducted in April 1981.

[5] Based on data compiled by the Association of Research Libraries.

[6] Based on matching faculty names provided by institutional coordinators with the names of research grant awardees from the three federal agencies.

[7] Based on data provided to the National Science Foundation by universities.

[8] Based on data compiled by the Institute for Scientific Information.

TABLE 2.1 Measures Compiled on Individual Research-Doctorate Programs in the Social and Behavioral Sciences

Program Size[1]

01 Reported number of faculty members in the program, December 1980.

02 Reported number of program graduates in last five years (July 1975 through June 1980).

03 Reported total number of full-time and part-time graduate students enrolled in the program who intend to earn doctorates, December 1980.

Characteristics of Graduates[2]

04 Fraction of FY1975-79 program graduates who had received some national fellowship or training grant support during their graduate education.

05 Median number of years from first enrollment in graduate school to receipt of the doctorate--FY1975-79 program graduates.[3]

06 Fraction of FY1975-79 program graduates who at the time they completed requirements for the doctorate reported that they had made definite commitments for postgraduation employment.

07 Fraction of FY1975-79 program graduates who at the time they completed requirements for the doctorate reported that they had made definite commitments for postgraduation employment in Ph.D.-granting universities.

Reputational Survey Results[4]

08 Mean rating of the scholarly quality of program faculty.

09 Mean rating of the effectiveness of the program in educating research scholars/scientists.

10 Mean rating of the improvement in program quality in the last five years.

11 Mean rating of the evaluators' familiarity with the work of the program's faculty.

University Library Size[5]

12 Composite index describing the library size in the university in which the program is located, 1979-80.

Research Support

13 Fraction of program faculty members holding research grants from the Alcohol, Drug Abuse, and Mental Health Administration, the National Institutes of Health, or the National Science Foundation at any time during the FY1978-80 period.[6]

14 Total expenditures (in thousands of dollars) reported by the university for research and development activities in a specified field, FY1979.[7]

Publication Records[8]

17 Number of published articles attributed to the program faculty members, 1978-80.

18 Fraction of program faculty members with one or more published articles, 1978-80.

[1] Based on information provided to the committee by the participating universities.

[2] Based on data compiled in the NRC's Survey of Earned Doctorates.

[3] In reporting standardized scores and correlations with other variables, a shorter time-to-Ph.D. is assigned a higher score.

[4] Based on responses to the committee's survey conducted in April 1981.

[5] Based on data compiled by the Association of Research Libraries.

[6] Based on matching faculty names provided by institutional coordinators with the names of research grant awardees from the three federal agencies.

[7] Based on data provided to the National Science Foundation by universities.

[8] Based on data compiled by the Institute for Scientific Information.

ogy. Fifteen of these were used in evaluating programs in anthropology and geography, and 14 were used in history. (Data on research expenditures are unavailable in each of the latter three disciplines, and data on ADAMHA/NIH/NSF research support of faculty investigators are not applicable to most programs in history.) For nine of the measures data are available describing most, if not all, of the social and behavioral science programs included in the assessment. For five measures the coverage is less complete but encompasses at least a majority of the programs in every discipline. The actual number of programs evaluated on every measure is reported in the second table in each of the next seven chapters.

The 16 measures describe a variety of aspects important to the operation and function of research-doctorate programs--and thus are relevant to the quality and effectiveness of programs in educating scientists for careers in research. However, not all of the measures may be viewed as "global indices of quality." Some, such as those relating to program size, are best characterized as "program descriptors" that, although not dimensions of quality per se, are thought to have a significant influence on the effectiveness of programs. Other measures, such as those relating to university library size and support for research and training, describe some of the resources generally recognized as being important in maintaining a vibrant program in graduate education. Measures derived from surveys of faculty peers or from the publication records of faculty members, on the other hand, have traditionally been regarded as indices of the overall quality of graduate programs. Yet these too are not true measures of quality.

> We often settle for an easy-to-gather statistic, perfectly legitimate for its own limited purposes, and then forget that we haven't measured what we want to talk about. Consider, for instance, the reputation approach of ranking graduate departments: We ask a sample of physics professors (say) which the best physics departments are and then tabulate and report the results. The "best" departments are those that our respondents say are the best. Clearly it is useful to know which are the highly regarded departments in a given field, but prestige (which is what we are measuring here) isn't exactly the same as quality.[*]

To be sure, each of the 16 measures reported in this assessment has its own set of limitations. In the sections that follow an explanation is provided of how each measure has been derived and its particular limitations as a descriptor of research-doctorate programs.

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[*] John Shelton Reed, "How Not to Measure What a University Does," The Chronicle of Higher Education, Vol. 22, No. 12, May 11, 1981, p. 56.

PROGRAM SIZE

Information was collected from the study coordinators at each university on the names and ranks of program faculty, doctoral student enrollment, and number of Ph.D. graduates in each of the past five years (FY1976-80). Each coordinator was instructed to include on the faculty list those individuals who, as of December 1, 1980, held academic appointments (typically at the rank of assistant, associate, and full professor) and who participated significantly in doctoral education. Emeritus and adjunct members generally were not to be included. Measure 01 represents the number of faculty identified in a program. Measure 02 is the reported number of graduates who earned Ph.D. or equivalent research doctorates in a program during the period from July 1, 1975, through June 30, 1980. Measure 03 represents the total number of full-time and part-time students reported to be enrolled in a program in the fall of 1980, who intended to earn research doctorates. All three of these measures describe different aspects of program size. In previous studies program size has been shown to be highly correlated with the reputational ratings of a program, and this relationship is examined in detail in this report. It should be noted that since the information was provided by the institutions participating in the study, the data may be influenced by the subjective decisions made by the individuals completing the forms. For example, some institutional coordinators may be far less restrictive than others in deciding who should be included on the list of program faculty. To minimize variation in interpretation, detailed instructions were provided to those filling out the forms.[5] Measure 03 is of particular concern in this regard since the coordinators at some institutions may not have known how many of the students currently enrolled in graduate study intended to earn doctoral degrees.

CHARACTERISTICS OF GRADUATES

One of the most meaningful measures of the success of a research-doctorate program is the performance of its graduates. How many go on to lead productive careers in research and/or teaching? Unfortunately, reliable information on the subsequent employment and career achievements of the graduates of individual programs is not available. In the absence of this directly relevant information, the committee has relied on four indirect measures derived from data compiled in the NRC's Survey of Earned Doctorates.[6] Although each measure has serious limitations (described below), the committee believes it more desirable to include this information than not to include data about program graduates.

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[5] A copy of the survey form with the instructions sent to study coordinators is included in Appendix A.

[6] A copy of the questionnaire used in this survey is found in Appendix B.

In identifying program graduates who had received their doctorates in the previous five years (FY1975-79),[7] the faculty lists furnished by the study coordinators at universities were compared with the names of dissertation advisers (available from the NRC survey). The latter source contains records for virtually all individuals who have earned research doctorates from U.S. universities since 1920. The institution, year, and specialty field of Ph.D. recipients were also used in determining the identity of program graduates. It is estimated that this matching process provided information on the graduate training and employment plans of more than 90 percent of the FY1975-79 graduates from the social and behavioral science programs. In the calculation of each of the four measures derived from the NRC survey, program data are reported only if the survey information is available on at least 10 graduates. Consequently, in a discipline with smaller programs--e.g., geography--slightly less than three-fourths of the programs are included in these measures, whereas nearly all of the economics, history, and psychology programs are included.

Measure 04 constitutes the fraction of FY1975-79 graduates of a program who had received at least some national fellowship support, including National Institutes of Health fellowships or traineeships, National Science Foundation fellowships, other federal fellowships, Woodrow Wilson fellowships, or fellowships/traineeships from other U.S. national organizations. One might expect the more selective programs to have a greater proportion of students with national fellowship support--especially "portable fellowships." Although the committee considered alternative measures of student ability (e.g., Graduate Record Examination scores, undergraduate grade point averages), reliable information of this sort was unavailable for a national assessment. It should be noted that the relevance of the fellowship measure varies considerably among disciplines. In the biomedical sciences a substantial fraction of the graduate students are supported by training grants and fellowships; in the social and behavioral sciences the majority are supported by teaching assistantships and research assistantships.

Measure 05 is the median number of years elapsed from the time program graduates first enrolled in graduate school to the time they received their doctoral degrees. For purposes of analysis the committee has adopted the conventional wisdom that the most talented students are likely to earn their doctoral degrees in the shortest periods of time--hence, the shorter the median time-to-Ph.D., the higher the standardized score that is assigned. Although this measure has frequently been employed in social science research as a proxy for student ability, one must regard its use here with some skepticism. It is quite possible that the length of time it takes a student to complete requirements for a doctorate may be significantly affected by the explicit or implicit policies of a university or department. For example, in certain cases a short time-to-Ph.D. may be indicative of less stringent requirements for the degree. Furthermore, previous studies have demonstrated that women and members of minority groups, for reasons having nothing to do with their abilities, are more likely than male Caucasians to interrupt their graduate education or to be enrolled on a part-time basis.[8] As a consequence, the median time-to-Ph.D. may be longer for programs with larger fractions of women and minority students.

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[7] Survey data for the FY1980 Ph.D. recipients had not yet been compiled at the time this assessment was undertaken.

Measure 06 represents the fraction of FY1975-79 program graduates who reported at the time they had completed requirements for the doctorate that they had signed contracts or made firm commitments for postgraduation employment (including postdoctoral appointments as well as other positions in the academic or nonacademic sectors) and who provided the names of their prospective employers. Although this measure is likely to vary discipline by discipline according to the availability of employment opportunities, a program's standing relative to other programs in the same discipline should not be affected by this variation. In theory, the graduates with the greatest promise should have the easiest time finding jobs. However, the measure is also influenced by a variety of other factors, such as personal job preferences and restrictions in geographic mobility, that are unrelated to the ability of the individual. It also should be noted parenthetically that unemployment rates for doctoral recipients are quite low and that nearly all of the graduates seeking jobs find positions soon after completing their doctoral programs.[9] Furthermore, first employment after graduation is by no means a measure of career achievement, which is what one would like to have if reliable data were available.

Measure 07, a variant of measure 06, constitutes the fraction of FY1975-79 program graduates who indicated that they had made firm commitments for employment in Ph.D.-granting universities and who provided the names of their prospective employers. This measure may be presumed to be an indication of the fraction of graduates likely to pursue careers in academic research, although there is no evidence concerning how many of them remain in academic research in the long term. In many social and behavioral science disciplines the path from Ph.D. to junior faculty has traditionally been regarded as the road of success for the growth and development of research talent. The committee is well aware, of course, that other paths, such as employment in the major laboratories of industry and government, provide equally attractive opportunities for growth. Indeed, in recent years increasing numbers

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[8] For a detailed analysis of this subject, see Dorothy M. Gilford and Joan Snyder, Women and Minority Ph.D.'s in the 1970's: A Data Book, National Academy of Sciences, Washington, D.C., 1977.

[9] For new Ph.D. recipients in science and engineering the unemployment rate has been less than 2 percent (see National Research Council, Postdoctoral Appointments and Disappointments, National Academy Press, Washington, D.C., 1981, p. 313).

TABLE 2.2 Percentage of FY1975-79 Doctoral Recipients with Definite Commitments for Employment Outside the Academic Sector*

Anthropology	16
Economics	32
Geography	18
History	22
Political Science	19
Psychology	47
Sociology	13

*Percentages are based on responses to the NRC's Survey of Earned Doctorates by those who indicated that they had made firm commitments for postgraduation employment and who provided the names of their prospective employers. These percentages may be considered to be lower-bound estimates of the actual percentages of doctoral recipients employed outside the academic sector.

of graduates are entering the nonacademic sectors. Unfortunately, the data compiled from the NRC's Survey of Earned Doctorates do not enable one to distinguish between employment in the top-flight laboratories of industry and government and employment in other areas of the nonacademic sectors. Accordingly, the committee has relied on a measure that reflects only the academic side and views this measure as a useful and interesting program characteristic rather than a dimension of quality. In the social and behavioral science disciplines, in which less than one-third of the graduates with definite employment plans intend to take jobs outside the academic environs (see Table 2.2), this limitation is of lesser concern than it is in the engineering and physical science disciplines.

The inclusion of measures 06 and 07 in this assessment has been an issue much debated by members of the committee; the strenuous objections by three committee members regarding the use of these measures are expressed in the Minority Statement, which follows Chapter X.

REPUTATIONAL SURVEY RESULTS

In April 1981 survey forms were mailed to a total of 1,770 faculty members in anthropology, economics, history, political science, psychology, and sociology. Survey forms were mailed to 150 geography faculty in September 1981. The evaluators were selected from the faculty lists furnished by the study coordinators at the 228 universities covered in the assessment. These evaluators constituted approximately 13 percent of the total faculty population--14,898 faculty members--in the social and behavioral science programs being evaluated (see Table 2.3). The survey sample was chosen on the basis of the number of faculty in a particular program and the number of doctorates awarded in the previous five years (FY1976-80)--with the stipulation that at least one evaluator was selected from every program covered in the assessment. In selecting the sample each faculty rank was represented in proportion to the total number of individuals holding that rank, and preference was given to those faculty members whom the study coordinators had nominated to serve as evaluators. As shown in Table 2.3, 1,686 individuals --88 percent of the survey sample in the social and behavioral sciences --had been recommended by study coordinators.[10]

Each evaluator was asked to consider a stratified random sample of no more than 50 research-doctorate programs in his or her discipline--with programs stratified by the number of faculty members associated with each program. Every program was included on 150 survey forms. The set of programs to be evaluated appeared on each survey form in random sequence, preceded by an alphabetized list of all programs in that discipline that were being included in the study. No evaluator was asked to consider a program at his or her own institution. Ninety percent of the survey sample group were provided the names of faculty members in each of the programs to be evaluated, along with data on the total number of doctorates awarded in the last five years.[11] The inclusion of this information represents a significant departure from the procedures used in earlier reputational assessments. For purposes of comparison with previous studies, 10 percent (randomly selected in each discipline) were not furnished any information other than the names of the programs.

The survey items were adapted from the form used in the Roose-Andersen study. Prior to mailing, the instrument was pretested using a small sample of faculty members in chemistry and psychology. As a result, two significant improvements were made in the original survey design. A question was added on the extent to which the evaluator was familiar with the work of the faculty in each program. Responses to this question, reported as measure 11, provide some insight into the relationship between faculty recognition and the reputational standing of a program.[12] Also added was a question on the evaluator's field of specialization--thereby making it possible to compare program evaluations in different specialty areas within a particular discipline.

A total of 1,195 faculty members in the social and behavioral sciences--62 percent of those asked to participate--completed and returned survey forms (see Table 2.3). Two factors probably have contributed to this response rate being approximately 17 percentage points below the rates reported in the Cartter and Roose-Andersen studies. First, because of the considerable expense of printing individualized survey forms (each 25-30 pages), second copies were not sent to sample members

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[10] A detailed analysis of the survey participants in each discipline is given in subsequent chapters.

[11] This information was furnished to the committee by the study coordinators at the universities participating in the study.

[12] Evidence of the strength of the relationship is provided by correlations presented in Chapters III-IX, and an analysis of the relationship is provided in Chapter X.

TABLE 2.3 Survey Response by Discipline and Characteristics of Evaluator

	Total Program Faculty	Survey Sample		
		Total	Respondents	
	N	N	N	%
Discipline of Evaluator				
Anthropology	1,181	210	125	60
Economics	2,163	279	185	66
Geography	640	150	106	71
History	2,820	306	166	54
Political Science	1,880	249	152	61
Psychology	4,299	450	280	62
Sociology	1,915	276	181	66
Faculty Rank				
Professor	7,629	1,000	628	63
Associate Professor	4,014	611	383	63
Assistant Professor	2,984	299	179	60
Other	271	10	5	50
Evaluator Selection				
Nominated by Institution	4,543	1,686	1,082	64
Other	10,355	234	113	48
Survey Form				
With Faculty Names	N/A*	1,728	1,072	62
Without Names	N/A*	192	123	64
Total All Fields	14,898	1,920	1,195	62

*Not applicable.

not responding to the first mailing[13]--as was done in the Cartter and Roose-Andersen efforts. Second, it is quite apparent that within the academic community there has been a growing dissatisfaction in recent years with educational assessments based on reputational measures. Indeed, this dissatisfaction was an important factor in the Conference Board's decision to undertake a multidimensional assessment, and some faculty members included in the sample made known to the committee their strong objections to the reputational survey.

As can be seen in Table 2.3, there is some variation in the response rates in the seven social and behavioral science disciplines. Of particular interest is the relatively high rate of response from geographers and the low rate from historians.[14] The high response rate in geography may be attributable, in part, to the fact that geography was added later to the original list of disciplines to be included in the assessment and consequently the timing and circumstances relating to the survey activity in this discipline were somewhat different. It is not surprising to find that the evaluators nominated by study coordinators responded more often than did those who had been selected at random. No appreciable differences were found among the response rates of assistant, associate, and full professors, nor between the rates of those evaluators who were furnished the abbreviated survey form (without lists of program faculty) and those who were given the longer version.

Each program was considered by an average of approximately 90 survey respondents from other programs in the same discipline. The evaluators were asked to judge programs in terms of scholarly quality of program faculty, effectiveness of the program in educating research scholars/scientists, and change in program quality in the last five years.[15] The mean ratings of a program on these three survey items constitute measures 08, 09, and 10. Evaluators were also asked to indicate the extent to which they were familiar with the work of the program faculty. The average of responses to this item constitutes measure 11.

In making judgments about the quality of faculty, evaluators were instructed to consider the scholarly competence and achievements of the individuals. The ratings were furnished on the following scale:

5	Distinguished
4	Strong
3	Good
2	Adequate
1	Marginal
0	Not sufficient for doctoral education
X	Don't know well enough to evaluate

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[13] A follow-up letter was sent to those not responding to the first mailing, and a second copy was distributed to those few evaluators who specifically requested another form.

[14] To compare the response rates obtained in the earlier surveys, see Roose and Andersen, Table 28, p. 29.

[15] A copy of the survey instrument with its instructions is included in Appendix C.

In assessing the effectiveness of a program, evaluators were asked to consider the accessibility of faculty, the curricula, the instructional and research facilities, the quality of the graduate students, the performance of graduates, and other factors that contribute to a program's effectiveness. This measure was rated accordingly:

3 Extremely effective
2 Reasonably effective
1 Minimally effective
0 Not effective
X Don't know well enough to evaluate

Evaluators were instructed to assess change in program quality on the basis of whether there has been improvement in the last five years in both the scholarly quality of faculty and the effectiveness in educating research scholars/scientists. The following alternatives were provided:

2 Better than five years ago
1 Little or no change in last five years
0 Poorer than five years ago
X Don't know well enough to evaluate

Evaluators were asked to indicate their familiarity with the work of the program faculty according to the following scale:

2 Considerable familiarity
1 Some familiarity
0 Little or no familiarity

In the computation of mean ratings on measures 08, 09, and 10, the "don't know" responses were ignored. An average program rating based on fewer than 15 responses (excluding the "don't know" responses) is not reported.

Measures 08, 09, and 10 are subject to many of the same criticisms that have been directed at previous reputational surveys. Although care has been taken to improve the sampling design and to provide evaluators with some essential information about each program, the survey results merely reflect a consensus of faculty opinions. As discussed in Chapter I, these opinions may well be based on out-of-date information or be influenced by a variety of factors unrelated to the quality of the program. In Chapter X a number of factors that may possibly affect the survey results are examined. In addition to these limitations, it should be pointed out that evaluators, on the average, were unfamiliar with almost one-third of the programs they were asked to consider.[16] As might be expected, the smaller and less prestigious programs were not as well known, and for this reason one might have less confidence in the average ratings of these programs. For all four survey measures, standard errors of the mean ratings are reported; they tend to be larger for the lesser known programs. The frequency of response to each of the survey items is discussed in Chapter X.

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[16] See Table 10.6 in Chapter X.

Two additional comments should be made regarding the survey activity. First, it should be emphasized that the ratings derived from the survey reflect a program's standing relative to other programs in the same discipline and provide no basis for making cross-disciplinary comparisons. For example, the fact that a much larger number of psychology programs received "distinguished" ratings on measure 08 than did anthropology programs indicates nothing about the relative quality of the faculty in these two disciplines. It may depend, in part, on the total numbers of programs evaluated in these disciplines; in the survey instructions it was suggested to evaluators that no more than 10 percent of the programs listed be designated as "distinguished." Nor is it advisable to compare the rating of a program in one discipline with that of a program in another discipline because the ratings are based on the opinions of different groups of evaluators who were asked to judge entirely different sets of programs. Second, early in the committee's deliberations a decision was made to supplement the ratings obtained from faculty members with ratings from evaluators who hold research-oriented positions in institutions outside the academic sector. These institutions include industrial research laboratories, government research laboratories, and a variety of other research establishments. Over the past 10 years increasing numbers of doctorate recipients have taken positions outside the academic setting. The extensive involvement of these graduates in nonacademic employment is reflected in the percentages reported in Table 2.2: An average of 31 percent of the recent graduates in the social and behavioral science disciplines who had definite employment plans indicated that they planned to take positions in nonacademic settings. Data from another NRC survey suggest that the actual fraction employed outside academia may be significantly higher. The committee recognized that the inclusion of nonacademic evaluators would furnish information valuable for assessing nontraditional dimensions of doctoral education and would provide an important new measure not assessed in earlier studies. Results from a survey of this group would provide an interesting comparison with the results obtained from the survey of faculty members. A concentrated effort was made to obtain supplemental funding for adding nonacademic evaluators in selected disciplines to the survey sample, but this effort was unsuccessful. The committee nevertheless remains convinced of the importance of including evaluators from nonacademic research institutions. These institutions are likely to employ increasing fractions of graduates in many disciplines, and it is urged that this group not be overlooked in future assessments of graduate programs.

UNIVERSITY LIBRARY SIZE

The university library holdings are generally regarded as an important resource for students in graduate (and undergraduate) education. The Association of Research Libraries (ARL) has compiled data from its academic member institutions and developed a composite measure of a university library's size relative to those of other ARL members. The ARL Library Index, as it is called, is based on 10 characteristics: volumes held, volumes added (gross), microform units held, current serials received, expenditures for library materials, expenditures for binding, total salary and wage expenditures, other operating expenditures, number of professional staff, and number of nonprofessional staff.[17] The 1979-80 index, which constitutes measure 12, is available for 89 of the 228 universities included in the assessment. (These 89 tend to be among the largest institutions.) The limited coverage of this measure is a major shortcoming. It should be noted that the ARL index is a composite description of library size and not a qualitative evaluation of the collections, services, or operations of the library. Also, it is a measure of aggregate size and does not take into account the library holdings in a particular department or discipline. Finally, although universities with more than one campus were instructed to include figures for the main campus only, some in fact may have reported library size for the entire university system. Whether this misreporting occurred is not known.

RESEARCH SUPPORT

Using computerized data files[18] provided by the National Science Foundation (NSF) and the National Institutes of Health (NIH), it was possible to identify which faculty members in each program had been awarded research grants during the FY1978-80 period by either of these agencies or by the Alcohol, Drug Abuse, and Mental Health Administration (ADAMHA). The fraction of faculty members in a program who had received any research grants from these agencies during this three-year period constitutes measure 13. Since these awards have been made on the basis of peer judgment, this measure is considered to reflect the perceived research competence of program faculty. However, it should be noted that significant amounts of support for research in the social and behavioral sciences come from other federal agencies and from private foundations and other nonfederal sources as well, though it was not feasible to compile data from these other sources. Perhaps as many as half of the faculty investigators in the social and behavioral sciences derive their support from nonfederal sponsors. It is estimated[19] that 22 percent of the university faculty members in these disciplines who received federal R&D funding obtained their support from NIH, another 20 percent from NSF, and approximately 13 percent from ADAMHA. The remaining 45 percent received support from a variety of other federal agencies. It also should be pointed out that only those faculty members who served as principal investigators or coinvestigators are counted in the computation of this measure. As mentioned earlier, since very few faculty members in history programs receive research support from NIH, NSF, or ADAMHA, measure 13 was not included in the assessment of programs in this discipline.

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[17] See Appendix D for a description of the calculation of this index.

[18] A description of these files is provided in Appendix E.

[19] Based on special tabulations of data from the NRC's Survey of Doctorate Recipients, 1979.

Measure 14 describes the total FY1979 expenditures by a university for R&D in a particular discipline. These data have been furnished to the NSF[20] by universities and include expenditures of funds from both federal and nonfederal sources. If an institution has more than one program being evaluated in the same discipline, the aggregate university expenditures for research in that discipline are reported for each of the programs. In each discipline data are recorded for the 100 universities with the largest R&D expenditures. As already mentioned, such data are not available for programs in anthropology, geography, and history.

This measure has several limitations related to the procedures by which the data have been collected. The committee notes that there is evidence within the source document[21] that universities use different practices for categorizing and reporting expenditures. Apparently, institutional support of research, industrial support of research, and expenditure of indirect costs are reported by different institutions in different categories (or not reported at all). Since measure 14 is based on total expenditures from all sources, the data used here are perturbed only when these types of expenditures are not subsumed under any reporting category. In contrast with measure 13, measure 14 is not reported on a scale relative to the number of faculty members and thus reflects the overall level of research activity at an institution in a particular discipline. Although research grants in the sciences and engineering provide some support for graduate students as well, these measures should not be confused with measure 04, which pertains to fellowships and training grants.

PUBLICATION RECORDS

Data from the 1978, 1979, and 1980 Social Science Citation Index[22] have been compiled on published articles by faculty members in anthropology, economics, geography, history, political science, psychology, and sociology. Publication counts were associated with research-doctorate programs by matching authors' names with the names of individual program faculty members (provided by the universities). To differentiate authors who have the same last name and first initial,[23] the matching process took into account the institutional affiliation of the author and the discipline of the journal in which the article appeared. In the case of a coauthored article, each author is fully credited with that article.

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[20] A copy of the survey instrument used to collect these data appears in Appendix E.

[21] National Science Foundation, Academic Science: R and D Funds, Fiscal Year 1979, U.S. Government Printing Office, Washington, D.C., NSF 81-301, 1981.

[22] The publication data have been compiled and provided for the committee's use by the Institute for Scientific Information.

Two measures have been derived from publication records: measure 17--the total number of articles published in the 1978-80 period that have been identified with individual faculty members in a research-doctorate program; and measure 18--the fraction of program faculty members with one or more published articles during this three-year period. Since both of these publication measures are based on individual name matches with program faculty, they are quite different from measures 15 and 16, which are presented in the committee's reports on research-doctorate programs in the mathematical and physical sciences, engineering, and biological sciences.[24] The latter two measures are associated with programs on the basis of the discipline of the journal in which an article appeared and the institution with which the author was affiliated. Therefore, articles by program faculty members, students, research personnel, and even members of other programs/departments in the university who publish in those journals are included. Measures 17 and 18 reported here reflect only articles authored by program faculty members.

Although physical and biological scientists publish a large share of their research in the form of articles, this is not as often the case for social or behavioral scientists. Thus, measure 17--confined to articles published in the 1978-80 period in journals covered by the Social Science Citation Index--tends to overestimate the contributions of faculty members who publish articles and to underestimate the contributions of those who publish in books. To the extent that the former more often do experimental and quantitative research and that the latter do qualitative, theoretical, and historical research, programs emphasizing experimental and quantitative orientations are likely to receive higher counts on this measure. The significance of book publication in the social and behavioral sciences should not be overlooked. A recently published list[25] of the most frequently cited authors in the social and behavioral sciences and their most frequently cited works suggests that books are of major significance in these disciplines.

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[23] The full names of individual authors are not available from the Social Science Citation Index.

[24] Data on measures 15 and 16 are also available for research-doctorate programs in psychology and are presented in Appendix J.

[25] E. Garfield, "The 100 Articles Most Cited by Social Scientists, 1969-77," Current Contents: Social and Behavioral Sciences, #32, August 7, 1978; and E. Garfield, "The 100 Books Most Cited by Social Scientists, 1969-77," Current Contents: Social and Behavioral Sciences, #37, September 11, 1978.

Readers should also be aware that measure 17 does not take into account the different sizes of programs. Thus, programs with larger faculties may appear to be more productive than those with smaller faculties. Since measure 17 reflects the total number of published articles by individual faculty members in a program, the average number of articles *per faculty member* may be derived by dividing measure 17 by the number of faculty members (measure 01). Measure 18--the *fraction* of faculty members with at least one published article during this three-year period--has been corrected for the program faculty size but does not reflect the rate at which individual members have written articles.

Since the data are confined to the years between 1978 and 1980 and were compiled by author's name and institutional affiliation, they do not take into account institutional mobility of authors during this three-year span. Thus, faculty members who have moved from one institution to another during this span are not credited with those articles for which the author's affiliation is his or her former institution.

Procedures for allocating credit for multiauthored papers must also be considered in assessing measures 17 and 18. Equal weight has been assigned to the program affiliations of all authors of such papers. Thus, these measures tend to overestimate the contributions of faculty members given to collaborative publications. It should also be noted that the *Social Science Citation Index* does not completely cover all journals in which social and behavioral scientists publish. For example, papers by psychologists working in the neurosciences may not be counted since many neuroscience journals do not appear in the *Social Science Citation Index*.[26] The same may be true for anthropologists, historians, and sociologists who tend to publish results of their research in traditionally humanistic journals not covered by the *Social Science Citation Index*. Finally, neither measure 17 or measure 18 provides any indication of the impact or influence of the articles written by program faculty members. Although publication productivity and the impact of published articles tend to be correlated, previous investigations[27] indicates that they are quite different variables. Citation counts, had it been feasible to compile them, would have complemented measures 17 and 18 and been a highly desirable measure in assessing the publication records of program faculty measures.

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[26] For a list of journals covered by the *Social Science Citation Index*, see Appendix F.

[27] J. R. Cole and S. Cole, "Measuring the Quality of Sociological Reseach: Problems in the Use of the Science Citation Index," *American Sociologist*, Vol. 6, No. 1, February 1971, pp. 23-28.

ANALYSIS AND PRESENTATION OF THE DATA

The next seven chapters present all of the information that has been compiled on individual research-doctorate programs in anthropology, economics, geography, history, political science, psychology, and sociology. Each chapter follows a similar format, designed to assist the reader in the interpretation of program data. The first table in each chapter provides a list of the programs evaluated in a discipline --including the names of the universities and departments or academic units in which programs reside--along with the full set of data compiled for individual programs. Programs are listed alphabetically according to name of institution, and both raw and standardized values are given for all measures. For the reader's convenience an insert of information from Table 2.1 is provided that identifies each of the 16 measures reported in the table and indicates the raw scale used in reporting values for a particular measure. Standardized values, converted from raw values to have a mean of 50 and a standard deviation of 10,[28] are computed for every measure so that comparisons can easily be made of a program's relative standing on different measures. Thus, a standardized value of 30 corresponds with a raw value that is two standard deviations below the mean for that measure, and a standardized value of 70 represents a raw value two standard deviations above the mean. While the reporting of values in standardized form is convenient for comparing a particular program's standing on different measures, it may be misleading in interpreting actual differences in the values reported for two or more programs--especially when the distribution of the measure being examined is highly skewed. For example, the numbers of published articles (measure 17) associated with four psychology programs are reported in Table 3.1 as follows:

Program	Raw Value	Standardized Value
A	2	37
B	5	38
C	27	41
D	32	42

Although programs C and D have many times the number of articles as have programs A and B, the differences reported on a standardized scale appear to be small. Thus, the reader is urged to take note of the raw values before attempting to interpret differences in the standardized values given for two or more programs.

The initial table in each chapter also presents estimated standard errors of mean ratings derived from the four survey items (measures 08-11). A standard error is an estimated standard deviation of the sample mean rating and may be used to assess the stability of a mean rating reported for a particular program.[29] For example, one may assert (with .95 confidence) that the population mean rating would lie within two standard errors of the sample mean rating reported in this assessment.

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[28] The conversion was made from the precise raw value rather than from the rounded value reported for each program. Thus, two programs may have the same reported raw value for a particular measure but different standardized values.

No attempt has been made to establish a composite ranking of programs in a discipline. Indeed, the committee is convinced that no single measure adequately reflects the quality of a research-doctorate program and wishes to emphasize the importance of viewing individual programs from the perspective of multiple indices or dimensions.

The second table in each chapter presents summary statistics (i.e., number of programs evaluated, mean, standard deviation, and decile values) for each of the program measures.[30] The reader should find these statistics helpful in interpreting the data reported on individual programs. Next is a table of the intercorrelations among the various measures for that discipline. This table should be of particular interest to those desiring information about the interrelations of the various measures.

The remainder of each chapter is devoted to an examination of results from the reputational survey. Included are an analysis of the characteristics of survey participants and graphical portrayals of the relationship of the mean rating of scholarly quality of faculty (measure 08) with the number of faculty (measure 01) and the relationship of the mean rating of program effectiveness (measure 09) with the number of graduates (measure 02). A frequently mentioned criticism of the Roose-Andersen and Cartter studies is that small but distinguished programs have been penalized in the reputational ratings because they are not as highly visible as larger programs of comparable quality. The comparisons of survey ratings with measures of program size are presented as the first two figures in each chapter and provide evidence about the number of small programs in each discipline that have received high reputational ratings. Since in each case the reputational rating is more highly correlated with the square root of program size than with the size measure itself, measures 01 and 02 are plotted on a square root scale.[31] To assist the reader in interpreting results of the survey evaluations, each chapter concludes with a graphical presentation of the mean rating for every program of the scholarly quality of faculty (measure 08) and an associated "confidence interval" of 1.5 standard errors. In comparing the mean ratings of two programs, if their reported confidence intervals of 1.5 standard errors do not overlap, one may safely conclude that the program ratings are significantly different (at the .05 level of significance)--i.e., the observed difference in mean ratings is too large to be plausibly attributable to sampling error.[32]

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[29] The standard error estimate has been computed by dividing the standard deviation of a program's ratings by the square root of the number of ratings. For a more extensive discussion of this topic, see Fred N. Kerlinger, Foundations of Behavioral Research, Holt, Reinhart, and Winston, Inc., New York, 1973, Chapter 12. Readers should note that the estimate is a measure of the variation in response and by no means includes all possible sources of error.

[30] Standardized scores have been computed from precise values of the mean and standard deviations of each measure and not the rounded values reported in the second table in each of the following chapters.

[31] For a general discussion of transforming variables to achieve linear fits, see John W. Tukey, Exploring Data Analysis, Addison-Wesley, Reading, Massachusetts, 1977.

The final chapter of this report gives an overview of the evaluation process in the seven social and behavioral science disciplines and includes a summary of general findings. Particular attention is given to some of the extraneous factors that may influence program ratings of individual evaluators and thereby distort the survey results. The chapter concludes with a number of specific suggestions for improving future assessments of research-doctorate programs.

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[32] This rule for comparing nonoverlapping intervals is valid as long as the ratio of the two estimated standard errors does not exceed 2.41. (The exact statistical significance of this criterion then lies between .050 and .034.) Inspection of the standard errors reported in each discipline shows that for programs with mean ratings differing by less than 1.0 (on measure 08), the standard error of one mean very rarely exceeds twice the standard error of another.

III

Anthropology Programs

In this chapter 70 research-doctorate programs in anthropology are assessed. These programs, according to the information supplied by their universities, have accounted for 1,960 doctoral degrees awarded during the FY1976-80 period--approximately 93 percent of the aggregate number of anthropology and archaeology doctorates earned from U.S. universities in this five-year span.[1] On the average, 51 full-time and part-time students intending to earn doctorates were enrolled in a program in December 1980, with an average faculty size of 17 members.[2] Nine programs were initiated since 1970, and no two programs are located in the same university. All of the 70 institutions initially identified as meeting the criteria[3] for inclusion in the assessment in anthropology are represented here.

Before examining individual program results presented in Table 3.1, the reader is urged to refer to Chapter II, in which each of the 16 measures used in the assessment is discussed. Summary statistics describing every measure are given in Table 3.2. For eight of the measures, data are reported for at least 64 of the 70 anthropology programs. For measures 04-07, which pertain to characteristics of the program graduates, data are presented for all but 10 of the programs; the others had too few graduates on which to base statistics.[4] For measure 12, a composite index of the size of a university library, data are available for 60 programs. The programs not evaluated on this measure are typically smaller--in terms of faculty size and graduate student enrollment--than other anthropology programs. Were data on this measure available for all 70 programs, it is likely that the reported mean would be appreciably lower (and that some of the correlations of this measure with others would be higher). As mentioned in the previous chapter, data on total university expenditures for research (measure 14) are not available in anthropology. With respect to the fraction of faculty with research grants from the Alcohol, Drug Abuse, and Mental Health Administration, the National Institutes of Health, or the National Science Foundation (measure 13) and the fraction of faculty with at least one published article (measure 18), data are reported for 59 anthropology programs.[5]

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[1] Data from the NRC's Survey of Earned Doctorates indicate that 1,965 research doctorates in anthropology and 137 in archaeology were awarded by U.S. universities between FY1976 and FY1980.

[2] See the reported means for measures 03 and 01 in Table 3.2.

[3] As mentioned in Chapter I, the primary criterion for inclusion was that a university had awarded at least 9 doctorates in anthropology during the FY1976-78 period.

[4] As mentioned in Chapter II, data for measures 04-07 are not reported if they are based on the survey responses of fewer than 10 FY1975-79 program graduates.

Intercorrelations among the 15 measures (Pearson product-moment coefficients) are given in Table 3.3. Of particular note are the high positive correlations of the measures of program size (01-03) with reputational survey ratings (08, 09) and the total number of 1978-80 articles by program faculty (measure 17). Figure 3.1 illustrates the relation between the mean rating of the scholarly quality of faculty (measure 08) and the number of faculty members (measure 01) for each of 70 programs in anthropology. Figure 3.2 plots the mean rating of program effectiveness (measure 09) against the total number of FY1976-80 program graduates (measure 02). In both figures there is a significant positive correlation between program size and reputational rating.

Table 3.4 describes the 125 faculty members who participated in the evaluation of anthropology programs. These individuals constituted 60 percent of those asked to respond to the survey in this discipline and 11 percent of the faculty population in the 70 research-doctorate programs being evaluated.[6] A majority of the survey participants were cultural or physical anthropologists; 22 percent were archaeologists. Two-thirds of these individuals had earned their highest degree prior to 1970, and a majority held the rank of full professor.

To assist the reader in interpreting results of the survey evaluations, estimated standard errors have been computed for mean ratings of the scholarly quality of faculty in 70 anthropology programs (and are given in Table 3.1). For each program the mean rating and an associated "confidence interval" of 1.5 standard errors are illustrated in Figure 3.3 (listed in order of highest to lowest mean rating). In comparing two programs, if their confidence intervals do not overlap, one may conclude that there is a significant difference in their mean ratings at a .05 level of significance.[7] From this figure it is also apparent that one should have somewhat more confidence in the accuracy of the mean ratings of higher-rated programs than lower-rated programs. This generalization results primarily from the fact that evaluators are not as likely to be familiar with the less prestigious programs, and consequently the mean ratings of these programs are usually based on fewer survey responses.

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[5] Data for measures 13 and 18 are not presented for any programs that had fewer than 10 faculty members.

[6] See Table 2.3 in Chapter II.

[7] See pp. 30-32 for a discussion of the interpretation of mean ratings and associated confidence intervals.

TABLE 3.1 Program Measures (Raw and Standardized Values) in Anthropology

Prog No.	University - Department/Academic Unit	Program Size			Characteristics of Program Graduates			
		(01)	(02)	(03)	(04)	(05)	(06)	(07)
001.	American University	10	26	30	.35	8.0	.60	.20
	Anthropology	*41*	*49*	*44*	*44*	*52*	*50*	*44*
002.	Arizona State University-Tempe	20	14	108	.44	7.9	.60	.33
	Anthropology	*54*	*42*	*67*	*48*	*53*	*50*	*55*
003.	Arizona, University of-Tucson	33	41	90	.30	9.0	.76	.49
	Anthropology	*71*	*58*	*62*	*42*	*44*	*63*	*67*
004.	Boston University	10	12	32	NA	NA	NA	NA
	*Anthropology**	*41*	*41*	*44*				
005.	Brandeis University	10	13	19	1.00	9.5	.50	.08
	Anthropology	*41*	*41*	*40*	*75*	*40*	*41*	*34*
006.	Brown University	13	17	47	.47	8.3	.50	.14
	Anthropology	*45*	*44*	*49*	*49*	*50*	*41*	*39*
007.	Bryn Mawr College	9	15	15	NA	7.2	NA	NA
	Anthropology	*40*	*42*	*39*		*59*		
008.	CUNY-Graduate School	33	27	85	.33	9.3	.46	.18
	Anthropology	*71*	*49*	*60*	*43*	*41*	*38*	*42*
009.	California, University of-Berkeley	32	96	118	.68	7.6	.74	.39
	Anthropology	*69*	*90*	*70*	*60*	*55*	*62*	*59*
010.	California, University of-Davis	19	29	25	.60	9.0	.64	.12
	Anthropology	*53*	*51*	*42*	*56*	*44*	*53*	*37*
011.	California, University of-Irvine	20	28	40	.46	6.4	.46	.17
	Social Relations/ Comparative Culture	*54*	*50*	*47*	*49*	*66*	*38*	*41*
012.	California, University of-Los Angeles	34	65	148	.48	8.8	.57	.25
	Anthropology	*72*	*72*	*79*	*50*	*46*	*47*	*48*
013.	California, University of-Riverside	9	22	37	.50	7.1	.75	.25
	Anthropology	*40*	*47*	*46*	*51*	*59*	*63*	*48*
014.	California, University of-San Diego	12	27	29	.67	7.5	.71	.50
	*Anthropology**	*44*	*49*	*43*	*59*	*56*	*59*	*69*
015.	California, University of-Santa Barbara	16	19	42	.68	7.3	.50	.17
	Anthropology	*49*	*45*	*47*	*60*	*58*	*41*	*41*
016.	Catholic University of America	6	17	34	.28	12.3	.63	.13
	Anthropology	*36*	*44*	*45*	*40*	*17*	*52*	*37*
017.	Chicago, University of	30	57	109	.83	8.4	.83	.52
	Anthropology	*67*	*67*	*67*	*67*	*49*	*69*	*71*
018.	Colorado, University of	18	49	47	.35	8.3	.66	.30
	Anthropology	*51*	*62*	*49*	*44*	*49*	*55*	*51*
019.	Columbia University	19	63	175	.58	8.8	.60	.27
	Anthropology	*53*	*70*	*87*	*55*	*45*	*49*	*49*
020.	Connecticut, University of-Storrs	17	17	40	NA	NA	NA	NA
	Anthropology	*50*	*44*	*47*				

* indicates program was initiated since 1970.

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TABLE 3.1 Program Measures (Raw and Standardized Values) in Anthropology

Prog No.	Survey Results				University Library	Research Support		Published Articles		Survey Ratings Standard Error			
	(08)	(09)	(10)	(11)	(12)	(13)	(14)	(17)	(18)	(08)	(09)	(10)	(11)
001.	1.3	0.8	0.9	0.3	NA	.00	NA	6	.50	.11	.14	.12	.05
	32	*29*	*44*	*27*		*33*		*38*	*41*				
002.	2.6	1.7	1.3	0.9	-0.3	.20	NA	27	.60	.09	.08	.09	.07
	48	*52*	*61*	*45*	*43*	*49*		*49*	*49*				
003.	4.0	2.3	1.2	1.6	0.9	.24	NA	54	.58	.08	.07	.08	.06
	66	*66*	*57*	*66*	*55*	*52*		*62*	*47*				
004.	2.2	1.2	0.7	0.9	-0.4	.10	NA	20	.60	.11	.10	.10	.07
	42	*40*	*37*	*45*	*43*	*41*		*45*	*49*				
005.	2.7	1.5	0.8	1.0	NA	.30	NA	5	.40	.10	.10	.06	.07
	49	*47*	*43*	*47*		*57*		*38*	*33*				
006.	2.3	1.4	0.9	0.9	-1.1	.23	NA	16	.54	.09	.09	.09	.07
	44	*45*	*45*	*45*	*36*	*51*		*43*	*44*				
007.	2.4	1.6	1.2	0.9	NA	NA	NA	17	NA	.12	.10	.08	.06
	45	*49*	*56*	*47*				*44*					
008.	3.7	1.9	1.3	1.3	NA	.24	NA	42	.61	.09	.08	.08	.07
	62	*56*	*60*	*58*		*52*		*56*	*50*				
009.	4.6	2.4	1.0	1.8	2.2	.38	NA	87	.66	.07	.07	.06	.05
	74	*69*	*47*	*73*	*68*	*62*		*78*	*54*				
010.	2.5	1.6	1.3	0.7	0.6	.21	NA	47	.74	.08	.08	.09	.06
	46	*50*	*60*	*41*	*53*	*50*		*59*	*60*				
011.	3.0	1.7	1.4	1.0	NA	.15	NA	16	.35	.10	.08	.08	.07
	53	*52*	*66*	*50*		*45*		*43*	*29*				
012.	3.8	2.1	1.2	1.4	2.0	.21	NA	52	.65	.07	.05	.06	.06
	63	*63*	*55*	*62*	*66*	*49*		*61*	*53*				
013.	2.3	1.5	0.8	0.8	-1.0	NA	NA	21	NA	.12	.10	.08	.07
	44	*47*	*42*	*43*	*37*			*46*					
014.	3.3	1.9	1.3	1.2	-0.0	.17	NA	16	.67	.14	.08	.07	.08
	57	*57*	*60*	*54*	*46*	*46*		*43*	*55*				
015.	3.5	1.9	1.4	1.3	-0.1	.38	NA	26	.81	.09	.07	.08	.06
	60	*56*	*63*	*58*	*45*	*62*		*48*	*66*				
016.	1.4	0.9	0.8	0.6	NA	NA	NA	1	NA	.10	.09	.09	.06
	33	*32*	*42*	*36*				*36*					
017.	4.6	2.4	0.8	1.8	0.9	.37	NA	77	.70	.08	.07	.07	.05
	73	*70*	*42*	*72*	*55*	*62*		*73*	*57*				
018.	2.5	1.6	0.7	0.9	-0.9	.22	NA	23	.56	.09	.08	.07	.08
	47	*49*	*36*	*47*	*38*	*51*		*47*	*46*				
019.	3.6	1.9	0.3	1.4	1.7	.47	NA	35	.74	.10	.06	.06	.07
	60	*56*	*22*	*62*	*64*	*70*		*53*	*60*				
020.	2.6	1.5	1.1	1.0	-0.5	.18	NA	10	.24	.09	.09	.10	.07
	48	*46*	*52*	*48*	*42*	*47*		*40*	*20*				

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TABLE 3.1 Program Measures (Raw and Standardized Values) in Anthropology

Prog No.	University - Department/Academic Unit	Program Size			Characteristics of Program Graduates			
		(01)	(02)	(03)	(04)	(05)	(06)	(07)
021.	Cornell University-Ithaca	23	43	37	.87	8.4	.74	.37
	Anthropology	*58*	*59*	*46*	*69*	*49*	*61*	*58*
022.	Duke University	15	14	23	.80	6.4	.60	.20
	Anthropology	*48*	*42*	*42*	*66*	*66*	*50*	*44*
023.	Florida, University of-Gainesville	25	35	78	.47	6.4	.47	.27
	Anthropology	*60*	*54*	*58*	*50*	*66*	*39*	*49*
024.	Georgia, University of-Athens	5	12	4	.18	10.7	.55	.00
	*Anthropology**	*35*	*41*	*36*	*36*	*30*	*45*	*27*
025.	Harvard University	19	78	111	.62	7.5	.69	.30
	Anthropology	*53*	*79*	*68*	*57*	*56*	*57*	*52*
026.	Hawaii, University of	15	30	66	.61	10.5	.57	.18
	Anthropology	*48*	*51*	*54*	*56*	*31*	*47*	*42*
027.	Illinois, University-Urbana/Champaign	26	52	71	.62	8.1	.89	.47
	Anthropology	*62*	*64*	*56*	*57*	*51*	*74*	*66*
028.	Indiana University-Bloomington	18	45	61	.40	9.6	.70	.28
	Anthropology	*51*	*60*	*53*	*46*	*39*	*59*	*50*
029.	Kansas, University of	15	17	27	.35	8.2	.65	.35
	Anthropology	*48*	*44*	*43*	*44*	*51*	*54*	*56*
030.	Kentucky, University of	11	10	28	NA	NA	NA	NA
	Anthropology	*43*	*40*	*43*				
031.	Massachusetts, University of-Amherst	17	26	90	.33	7.1	.62	.48
	Anthropology	*50*	*49*	*62*	*43*	*59*	*52*	*67*
032.	Michigan State University-East Lansing	21	32	49	.45	9.1	.77	.50
	Anthropology	*55*	*52*	*49*	*49*	*43*	*64*	*69*
033.	Michigan, University of-Ann Arbor	43	63	56	.44	7.1	.68	.39
	Anthropology	*83*	*70*	*51*	*48*	*60*	*56*	*59*
034.	Minnesota, University of	14	23	19	.48	8.7	.63	.29
	Anthropology	*46*	*47*	*40*	*50*	*47*	*52*	*51*
035.	Missouri, University of-Columbia	12	16	23	.33	7.8	.48	.26
	Anthropology	*44*	*43*	*42*	*43*	*54*	*40*	*49*
036.	New Mexico, University of-Albuquerque	26	23	101	.41	7.7	.53	.29
	Anthropology	*62*	*47*	*65*	*47*	*55*	*44*	*51*
037.	New School for Social Research	5	30	63	.11	9.5	.77	.29
	*Anthropology**	*35*	*51*	*54*	*32*	*40*	*64*	*51*
038.	New York University	10	19	13	.39	8.5	.67	.28
	Anthropology	*41*	*45*	*39*	*46*	*48*	*56*	*50*
039.	North Carolina, University of-Chapel Hill	20	24	45	.67	8.6	.63	.38
	Anthropology	*54*	*48*	*48*	*59*	*47*	*52*	*58*
040.	Northwestern University	14	31	28	.53	6.5	.64	.36
	Anthropology	*46*	*52*	*43*	*53*	*65*	*54*	*57*

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TABLE 3.1 Program Measures (Raw and Standardized Values) in Anthropology

Prog No.	Survey Results				University Library	Research Support		Published Articles		Survey Ratings Standard Error			
	(08)	(09)	(10)	(11)	(12)	(13)	(14)	(17)	(18)	(08)	(09)	(10)	(11)
021.	3.3	2.0	0.8	1.2	1.6	.04	NA	33	.61	.09	.05	.09	.06
	57	60	43	56	63	37		52	50				
022.	3.0	1.8	1.4	1.1	0.3	.40	NA	30	.60	.09	.07	.10	.07
	53	54	63	52	50	64		50	49				
023.	3.3	1.7	1.8	1.2	0.8	.24	NA	54	.64	.10	.08	.06	.08
	57	53	80	54	54	52		62	52				
024.	1.0	0.6	0.8	0.6	0.4	NA	NA	9	NA	.11	.09	.14	.07
	27	25	42	37	51			40					
025.	3.8	2.1	0.5	1.7	3.0	.42	NA	42	.74	.10	.07	.07	.05
	63	61	31	70	76	66		56	60				
026.	2.8	1.8	1.0	0.8	-0.1	.07	NA	32	.73	.09	.07	.09	.06
	51	54	51	44	45	39		51	60				
027.	3.5	1.9	1.1	1.3	2.0	.31	NA	40	.65	.08	.06	.07	.06
	60	57	51	58	66	57		55	54				
028.	2.8	1.8	0.9	1.0	0.9	.11	NA	25	.61	.09	.07	.06	.06
	50	55	47	48	56	42		48	50				
029.	2.3	1.4	1.0	0.8	0.1	.20	NA	36	.60	.10	.10	.09	.07
	44	44	48	43	48	49		53	49				
030.	2.0	1.2	1.0	0.7	-0.1	.09	NA	9	.46	.12	.11	.12	.07
	41	40	49	40	46	40		40	37				
031.	3.1	1.9	1.4	1.2	-0.7	.24	NA	44	.82	.10	.08	.09	.08
	54	58	63	53	39	52		57	67				
032.	2.6	1.7	1.0	0,9	0.3	.24	NA	14	.43	.10	.07	.09	.07
	48	51	48	46	50	52		42	35				
033.	4.5	2.6	1.1	1.7	1.8	.40	NA	114	.67	.07	.05	.07	.05
	73	74	52	71	64	64		92	55				
034.	2.5	1.4	0.7	0.8	1.2	.07	NA	13	.43	.10	.09	.09	.06
	46	44	37	42	58	39		42	35				
035.	2.2	1.4	0.7	0.8	-0.2	.33	NA	27	.75	.10	.11	.09	.08
	43	45	37	42	45	59		49	61				
036.	3.6	2.0	1.4	1.3	-1.0	.04	NA	37	.58	.08	.06	.07	.06
	61	59	64	59	37	36		54	47				
037.	2.0	1.0	0.9	1.0	NA	NA	NA	14	NA	.16	.12	.08	.07
	41	35	45	48				42					
038.	2.5	1.5	0.7	1.1	0.5	.50	NA	23	.60	.10	.08	.10	.07
	47	47	36	51	51	72		47	49				
039.	2.8	1.7	0.9	1.0	1.0	.25	NA	17	.45	.09	.08	.09	.07
	51	53	47	49	56	53		44	37				
040.	3.6	2.1	1.3	1.5	0.3	.43	NA	36	.71	.07	.06	.09	.06
	61	61	63	65	49	67		53	58				

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TABLE 3.1 Program Measures (Raw and Standardized Values) in Anthropology

Prog No.	University - Department/Academic Unit	Program Size			Characteristics of Program Graduates			
		(01)	(02)	(03)	(04)	(05)	(06)	(07)
041.	Ohio State University-Columbus	12	18	26	.53	7.3	.53	.33
	Anthropology	*44*	*44*	*43*	*53*	*58*	*44*	*55*
042.	Oklahoma, University of-Norman	9	10	28	.10	8.5	.50	.30
	Anthropology	*40*	*40*	*43*	*32*	*48*	*41*	*52*
043.	Oregon, University of-Eugene	11	30	59	.56	8.2	.42	.14
	Anthropology	*43*	*51*	*52*	*54*	*50*	*34*	*38*
044.	Pennsylvania State University	13	28	40	.28	7.1	.46	.25
	Anthropology	*45*	*50*	*47*	*40*	*60*	*38*	*48*
045.	Pennsylvania, University of	32	38	108	.55	9.1	.76	.32
	Anthropology	*69*	*56*	*67*	*53*	*43*	*63*	*54*
046.	Pittsburgh, University of	23	46	88	.63	9.6	.58	.21
	Anthropology	*58*	*60*	*61*	*57*	*39*	*48*	*44*
047.	Princeton University	7	13	15	.82	7.9	.64	.36
	Anthropology	*37*	*41*	*39*	*66*	*53*	*53*	*57*
048.	Rice University	7	8	15	NA	NA	NA	NA
	Anthropology	*37*	*38*	*39*				
049.	Rochester, University of	9	11	22	NA	NA	NA	NA
	Anthropology	*40*	*40*	*41*				
050.	Rutgers, The State University-New Brunswick	16	15	75	.60	7.0	.64	.36
	Anthropology	*49*	*42*	*57*	*56*	*61*	*53*	*57*
051.	SUNY at Albany	12	16	43	.00	NA	NA	NA
	*Anthropology**	*44*	*43*	*48*	*27*			
052.	SUNY at Binghamton	18	17	75	.31	8.2	.56	.25
	Anthropology	*51*	*44*	*57*	*42*	*51*	*47*	*48*
053.	SUNY at Buffalo	21	32	55	.23	7.2	.69	.17
	Anthropology	*55*	*52*	*51*	*38*	*59*	*58*	*41*
054.	SUNY at Stony Brook	14	26	62	.16	6.4	.42	.16
	Anthropology	*46*	*49*	*53*	*35*	*65*	*35*	*40*
055.	Southern Illinois University-Carbondale	14	26	31	.36	9.3	.46	.21
	Anthropology	*46*	*49*	*44*	*44*	*41*	*38*	*44*
056.	Southern Methodist University	17	19	53	.40	8.5	.40	.07
	Anthropology	*50*	*45*	*51*	*46*	*48*	*33*	*32*
057.	Stanford University	19	34	51	.95	8.5	.67	.42
	Anthropology	*53*	*53*	*50*	*73*	*48*	*56*	*62*
058.	Syracuse University	8	19	22	.29	10.3	.35	.10
	Anthropology	*39*	*45*	*41*	*41*	*33*	*29*	*35*
059.	Tennessee, University of-Knoxville	11	7	24	NA	NA	NA	NA
	*Anthropology**	*43*	*38*	*42*				
060.	Texas, University of-Austin	27	48	47	.35	6.6	.64	.26
	Anthropology	*63*	*62*	*49*	*44*	*64*	*54*	*49*

* indicates program was initiated since 1970.

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TABLE 3.1 Program Measures (Raw and Standardized Values) in Anthropology

Prog No.	Survey Results				University Library	Research Support		Published Articles		Survey Ratings Standard Error			
	(08)	(09)	(10)	(11)	(12)	(13)	(14)	(17)	(18)	(08)	(09)	(10)	(11)
041.	2.0	1.4	1.1	0.7	0.9	.17	NA	13	.42	.09	.08	.05	.06
	40	*45*	*54*	*40*	*55*	*46*		*42*	*34*				
042.	1.4	0.9	1.0	0.5	-0.6	NA	NA	9	NA	.12	.10	.15	.07
	32	*32*	*48*	*33*	*41*			*40*					
043.	2.3	1.5	0.8	0.7	-0.9	.09	NA	15	.73	.11	.10	.08	.07
	44	*47*	*42*	*41*	*37*	*40*		*43*	*59*				
044.	3.0	1.8	1.0	1.1	0.7	.31	NA	27	.77	.11	.09	.09	.07
	53	*55*	*48*	*53*	*54*	*57*		*49*	*63*				
045.	4.1	2.3	1.1	1.6	0.7	.19	NA	42	.59	.08	.06	.07	.06
	67	*66*	*53*	*66*	*53*	*48*		*56*	*49*				
046.	3.0	1.8	0.9	1.3	0.1	.22	NA	69	.70	.08	.07	.09	.06
	53	*54*	*45*	*57*	*47*	*50*		*69*	*57*				
047.	2.5	1.5	0.9	1.1	0.9	NA	NA	17	NA	.13	.09	.09	.07
	47	*46*	*44*	*52*	*55*			*44*					
048.	1.9	0.9	0.7	0.9	-1.4	NA	NA	15	NA	.15	.13	.10	.07
	39	*33*	*38*	*44*	*32*			*43*					
049.	2.0	1.5	0.9	0.8	-0.6	NA	NA	3	NA	.12	.10	.06	.07
	41	*46*	*45*	*41*	*40*			*37*					
050.	3.2	1.7	1.3	1.4	0.8	.00	NA	28	.75	.10	.09	.08	.07
	56	*51*	*60*	*59*	*54*	*33*		*49*	*61*				
051.	2.1	1.1	1.2	0.8	-1.0	.25	NA	35	.83	.12	.09	.11	.07
	41	*37*	*55*	*44*	*37*	*53*		*53*	*68*				
052.	2.6	1.7	1.3	1.0	NA	.33	NA	35	.44	.10	.09	.09	.07
	48	*51*	*61*	*50*		*59*		*53*	*36*				
053.	2.8	1.6	1.2	1.2	0.3	.24	NA	39	.67	.08	.07	.08	.07
	51	*51*	*55*	*54*	*49*	*52*		*55*	*55*				
054.	2.4	1.3	0.9	0.9	-0.6	.00	NA	27	.64	.09	.10	.10	.07
	45	*42*	*46*	*46*	*40*	*33*		*49*	*53*				
055.	2.1	1.3	1.1	0.8	-0.2	.29	NA	31	.79	.11	.10	.11	.07
	41	*43*	*52*	*41*	*45*	*55*		*51*	*64*				
056.	2.4	1.4	1.2	0.8	NA	.18	NA	14	.47	.11	.09	.12	.08
	45	*46*	*56*	*42*		*47*		*42*	*39*				
057.	3.8	2.3	0.9	1.5	2.0	.37	NA	27	.63	.10	.08	.07	.06
	63	*66*	*45*	*65*	*67*	*62*		*49*	*52*				
058.	1.8	1.1	0.8	0.6	-0.3	NA	NA	17	NA	.13	.11	.09	.07
	38	*36*	*42*	*37*	*43*			*44*					
059.	1.7	1.2	1.2	0.6	-0.4	.18	NA	27	.64	.13	.11	.11	.08
	36	*40*	*56*	*37*	*42*	*47*		*49*	*52*				
060.	3.5	2.1	1.3	1.3	1.6	.11	NA	58	.70	.09	.07	.08	.07
	59	*61*	*62*	*57*	*63*	*42*		*64*	*58*				

NOTE: On the first line of data for every program, raw values for each measure are reported; on the second line values are reported in standardized form, with mean = 50 and standard deviation = 10. "NA" indicates that the value for a measure is not available.

TABLE 3.1 Program Measures (Raw and Standardized Values) in Anthropology

Prog No.	University - Department/Academic Unit	Program Size (01)	(02)	(03)	Characteristics of Program Graduates (04)	(05)	(06)	(07)
061.	Tulane University	10	14	60	.69	10.0	.44	.06
	Anthropology	*41*	*42*	*53*	*60*	*35*	*36*	*32*
062.	Utah, University of-Salt Lake City	15	9	24	NA	NA	NA	NA
	Anthropology	*48*	*39*	*42*				
063.	Virginia, University of	17	11	30	NA	NA	NA	NA
	*Anthropology**	*50*	*40*	*44*				
064.	Washington State University-Pullman	17	35	31	.29	8.1	.68	.42
	*Anthropology**	*50*	*54*	*44*	*41*	*52*	*56*	*62*
065.	Washington University-Saint Louis	8	18	25	.47	9.0	.63	.32
	Anthropology	*39*	*44*	*42*	*50*	*44*	*53*	*53*
066.	Washington, University of-Seattle	25	35	61	.64	9.3	.50	.18
	Anthropology	*60*	*54*	*53*	*58*	*42*	*41*	*42*
067.	Wayne State University	13	17	9	.36	9.7	.36	.27
	Anthropology	*45*	*44*	*37*	*45*	*38*	*30*	*50*
068.	Wisconsin, University of-Madison	17	34	67	.69	7.6	.54	.32
	Anthropology	*50*	*53*	*55*	*60*	*56*	*45*	*54*
069.	Wisconsin, University of-Milwaukee	11	17	16	.21	6.9	.71	.29
	*Anthropology**	*43*	*44*	*40*	*37*	*61*	*60*	*51*
070.	Yale University	24	32	59	.61	7.1	.76	.46
	Anthropology	*59*	*52*	*52*	*56*	*60*	*63*	*65*

* indicates program was initiated since 1970.

NOTE: On the first line of data for every program, raw values for each measure are reported; on the second line values are reported in standardized form, with mean = 50 and standard deviation = 10. "NA" indicates that the value for a measure is not available.

TABLE 3.1 Program Measures (Raw and Standardized Values) in Anthropology

Prog No.	Survey Results				University Library	Research Support		Published Articles		Survey Ratings Standard Error			
	(08)	(09)	(10)	(11)	(12)	(13)	(14)	(17)	(18)	(08)	(09)	(10)	(11)
061.	2.5	1.5	0.8	1.0	-1.0	.10	NA	12	.60	.10	.08	.07	.06
	47	*48*	*40*	*49*	*36*	*41*		*41*	*49*				
062.	2.2	1.3	1.1	0.8	-0.6	.00	NA	23	.60	.10	.11	.09	.06
	42	*43*	*53*	*42*	*40*	*33*		*47*	*49*				
063.	3.0	1.6	1.5	1.2	0.7	.06	NA	23	.59	.11	.09	.08	.07
	53	*49*	*71*	*54*	*54*	*38*		*47*	*48*				
064.	2.2	1.4	1.3	0.6	-0.3	.18	NA	24	.41	.11	.11	.09	.07
	43	*45*	*61*	*37*	*44*	*47*		*47*	*34*				
065.	2.4	1.5	1.0	1.1	-0.4	NA	NA	9	NA	.11	.09	.10	.07
	45	*47*	*48*	*53*	*43*			*40*					
066.	3.1	1.9	1.2	1.2	1.5	.24	NA	61	.52	.09	.07	.08	.06
	55	*58*	*57*	*55*	*61*	*52*		*65*	*43*				
067.	2.0	1.1	1.0	0.7	-0.4	.08	NA	22	.62	.12	.11	.08	.07
	41	*37*	*48*	*38*	*43*	*39*		*46*	*50*				
068.	3.0	1.8	0.8	1.1	1.6	.35	NA	39	.71	.09	.08	.07	.07
	53	*56*	*41*	*53*	*62*	*61*		*55*	*58*				
069.	2.3	1.3	0.8	0.9	NA	.00	NA	27	.64	.09	.08	.08	.07
	44	*43*	*41*	*45*		*33*		*49*	*52*				
070.	3.9	2.2	0.9	1.5	2.1	.38	NA	56	.58	.08	.06	.07	.06
	65	*63*	*45*	*64*	*67*	*62*		*63*	*48*				

NOTE: On the first line of data for every program, raw values for each measure are reported; on the second line values are reported in standardized form, with mean = 50 and standard deviation = 10. "NA" indicates that the value for a measure is not available.

TABLE 3.2 Summary Statistics Describing Each Program Measure--Anthropology

Measure	Number of Programs Evaluated	Mean	Standard Deviation	DECILES 1	2	3	4	5	6	7	8	9
Program Size												
01 Raw Value	70	17	8	8	10	12	14	15	17	19	23	27
Std Value	70	50	10	39	41	44	46	48	50	53	58	63
02 Raw Value	70	28	17	11	14	17	19	24	28	32	35	49
Std Value	70	50	10	40	42	44	45	48	50	52	54	62
03 Raw Value	70	51	34	16	24	28	32	42	51	61	75	101
Std Value	70	50	10	40	42	43	44	47	50	53	57	65
Program Graduates												
04 Raw Value	61	.48	.21	.22	.31	.35	.40	.47	.52	.60	.64	.69
Std Value	61	50	10	38	42	44	46	50	52	56	58	60
05 Raw Value	61	8.3	1.2	9.7	9.3	9.0	8.5	8.2	7.9	7.5	7.1	6.9
Std Value	61	50	10	38	41	44	48	51	53	56	60	61
06 Raw Value	60	.60	.12	.44	.48	.53	.57	.62	.64	.67	.70	.76
Std Value	60	50	10	37	40	44	48	52	53	56	58	63
07 Raw Value	60	.28	.12	.12	.17	.20	.25	.28	.30	.33	.37	.46
Std Value	60	50	10	37	41	43	48	50	52	54	58	65
Survey Results												
08 Raw Value	70	2.8	.8	1.9	2.1	2.3	2.5	2.6	2.8	3.1	3.5	3.8
Std Value	70	50	10	39	42	44	47	48	51	54	59	63
09 Raw Value	70	1.6	.4	1.1	1.3	1.4	1.5	1.6	1.7	1.8	1.9	2.1
Std Value	70	50	10	38	42	45	47	50	52	55	57	62
10 Raw Value	70	1.0	.3	.7	.8	.9	.9	1.0	1.1	1.2	1.3	1.3
Std Value	70	50	10	37	41	45	45	49	53	57	61	61
11 Raw Value	70	1.1	.3	.6	.8	.8	.9	1.0	1.1	1.2	1.3	1.5
Std Value	70	50	10	36	42	42	45	48	52	55	58	64
University Library												
12 Raw Value	60	.4	1.0	-1.0	-.6	-.4	-.1	.3	.6	.9	1.2	1.8
Std Value	60	50	10	36	40	42	45	49	52	55	58	64
Research Support												
13 Raw Value	59	.22	.13	.03	.09	.14	.18	.21	.24	.26	.34	.38
Std Value	59	50	10	35	40	44	47	49	52	53	59	62
Publication Records												
17 Raw Value	70	30	20	9	14	17	23	27	28	35	42	54
Std Value	70	50	10	40	42	44	47	49	49	53	56	62
18 Raw Value	59	.61	.12	.43	.49	.58	.60	.61	.64	.67	.72	.75
Std Value	59	50	10	35	40	48	49	50	53	55	59	62

NOTE: Standardized values reported in the preceding table have been computed from exact values of the mean and standard deviation and not the rounded values reported here.

TABLE 3.3 Intercorrelations Among Program Measures on 70 Programs in Anthropology

	Measure															
	01	02	03	04	05	06	07	08	09	10	11	12	13	14	17	18
Program Size																
01		.69	.64	.20	.18	.30	.38	.83	.81	.32	.72	.58	.24	N/A	.82	.05
02			.68	.23	.10	.43	.35	.71	.68	-.15	.67	.68	.39	N/A	.70	.24
03				.14	.02	.19	.23	.65	.60	.01	.63	.40	.25	N/A	.53	.25
Program Graduates																
04					.06	.18	.18	.49	.54	-.09	.44	.45	.26	N/A	.15	-.07
05						.10	.33	.34	.35	.37	.30	.13	.10	N/A	.25	.13
06							.68	.40	.40	-.11	.44	.45	.21	N/A	.30	.03
07								.50	.52	.08	.47	.35	.21	N/A	.35	.05
Survey Results																
08									.96	.21	.95	.64	.46	N/A	.75	.26
09										.23	.89	.63	.48	N/A	.73	.24
10											.11	-.08	-.16	N/A	.20	-.04
11												.65	.51	N/A	.71	.30
University Library																
12													.43	N/A	.53	.05
Research Support																
13														N/A	.39	.22
14															N/A	N/A
Publication Records																
17																.41
18																

NOTE: Since in computing correlation coefficients program data must be available for both of the measures being correlated, the actual number of programs on which each coefficient is based varies.

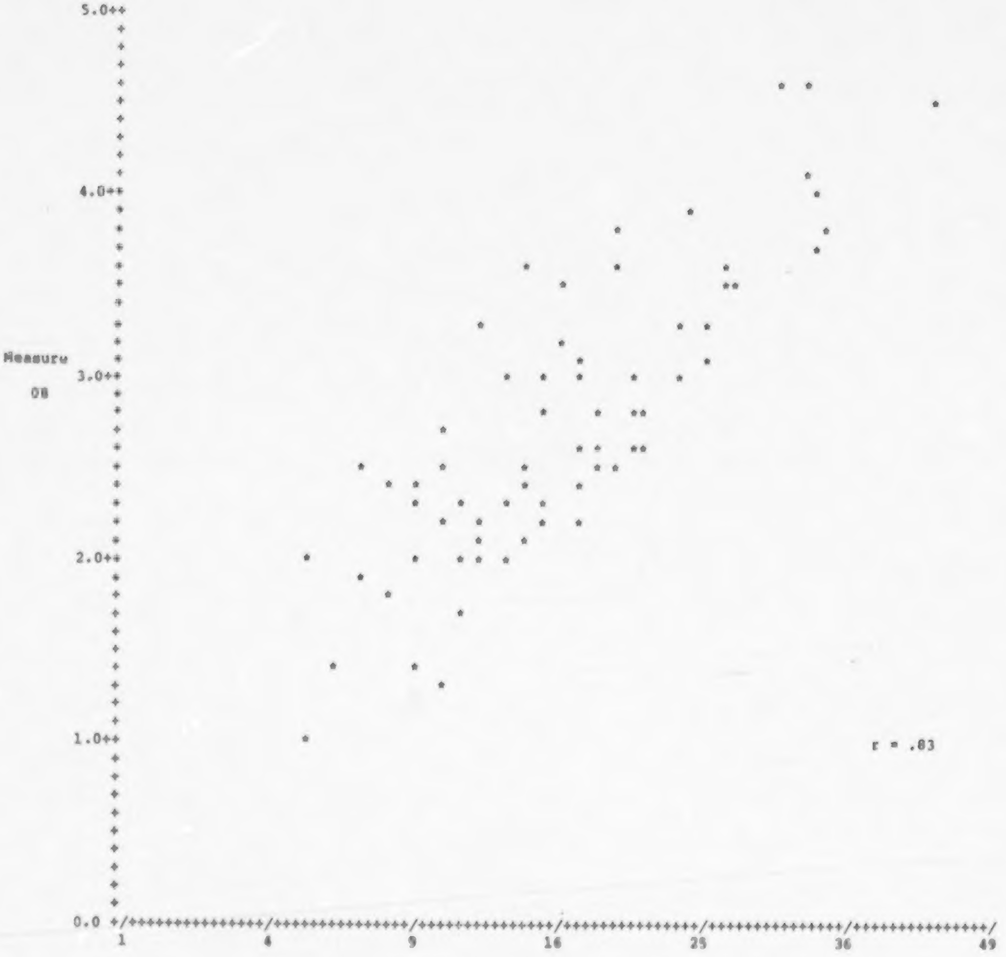

FIGURE 3.1 Mean rating of scholarly quality of faculty (measure 08) versus number of faculty members (measure 01)--70 programs in anthropology.

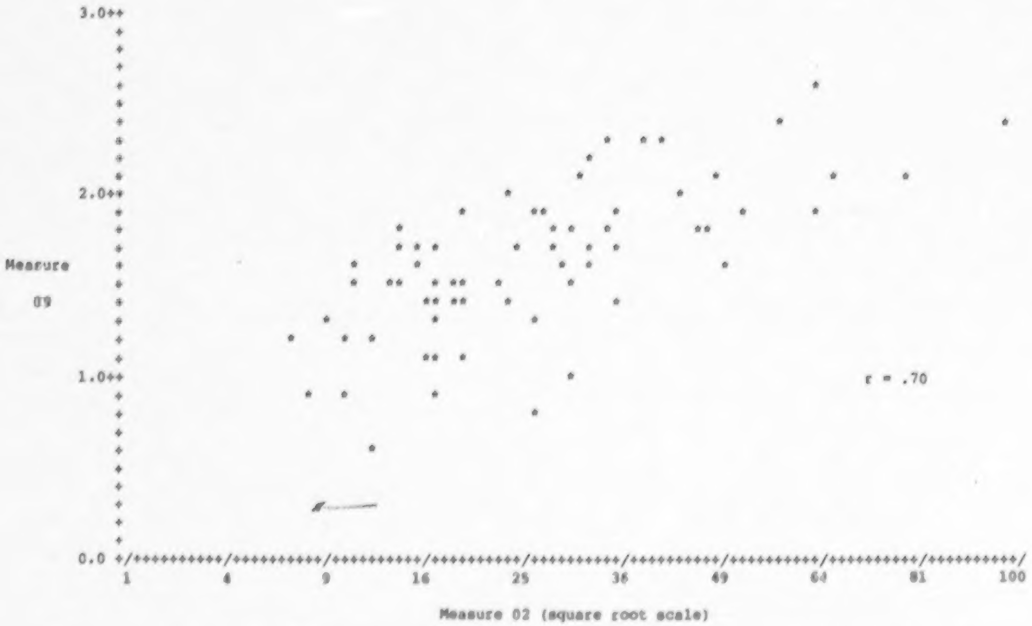

FIGURE 3.2 Mean rating of program effectiveness in educating research scholars/scientists (measure 09) versus number of graduates in last five years (measure 02)--70 programs in anthropology.

TABLE 3.4 Characteristics of Survey Participants in Anthropology

	Respondents	
	N	%
Field of Specialization		
Archaeology	28	22
Cultural Anthropology	70	56
Physical Anthropology	17	14
Other/Unknown	10	8
Faculty Rank		
Professor	71	57
Associate Professor	38	30
Assistant Professor	16	13
Year of Highest Degree		
Pre-1950	3	2
1950-59	22	18
1960-69	55	44
Post-1969	44	35
Unknown	1	1
Evaluator Selection		
Nominated by Institution	112	90
Other	13	10
Survey Form		
With Faculty Names	111	89
Without Names	14	11
Total Evaluators	125	100

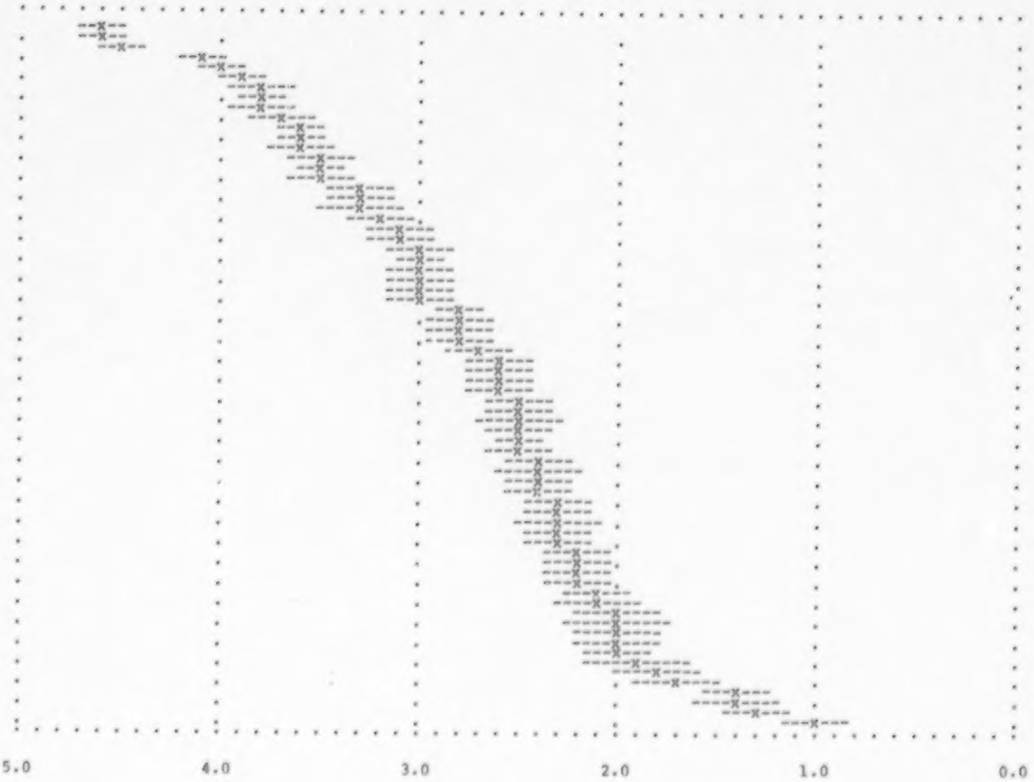

FIGURE 3.3 Mean rating of scholarly quality of faculty in 70 programs in anthropology.

NOTE: Programs are listed in sequence of mean rating, with the highest-rated program appearing at the top of the page. The broken lines (---) indicate a confidence interval of ±1.5 standard errors around the reported mean (x) of each program.

IV

Economics Programs

In this chapter 93 research-doctorate programs in economics are assessed. These programs, according to the information supplied by their universities, have accounted for 3,770 doctoral degrees awarded during the FY1976-80 period--approximately 92 percent of the aggregate number of economics and econometrics doctorates earned from U.S. universities in this five-year span.[1] On the average, 68 full-time and part-time students intending to earn doctorates were enrolled in a program in December 1980, with an average faculty size of 23 members.[2] Two programs were initiated since 1970. Each of two institutions--the University of California (Davis) and Oklahoma State University--has two economics programs included in the assessment. In addition to the 91 institutions represented in this discipline, another 3 were initially identified as meeting the criteria[3] for inclusion in the assessment:

Colorado School of Mines
SUNY at Buffalo
Utah State University--Logan

The Colorado School of Mines chose not to participate in the assessment in any discipline. Economics programs at the other two institutions have not been included in the evaluations in this discipline, since in each case the study coordinator either indicated that the institution did not at that time have a research-doctorate program in economics or failed to provide the information requested by the committee.

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[1] Data from the NRC's Survey of Earned Doctorates indicate that 3,966 research doctorates in economics and another 126 research doctorates in econometrics were awarded by U.S. universities between FY1976 and FY1980.

[2] See the reported means for measures 03 and 01 in Table 4.2.

[3] As mentioned in Chapter I, the primary criterion for inclusion was that a university had awarded at least 12 doctorates in economics during the FY1976-78 period.

Before examining individual program results presented in Table 4.1, the reader is urged to refer to Chapter II, in which each of the 16 measures used in the assessment is discussed. Summary statistics describing every measure are given in Table 4.2. For 14 of the measures, data are reported for at least 91 of the 93 economics programs. For measure 12, a composite index of the size of a university library, data are available for 75 programs; for measure 14, the total university expenditures for research in this discipline, data are available for 69 programs. The programs not evaluated on measures 12 and 14 are typically smaller--in terms of faculty size and graduate student enrollment--than other economics programs. Were data on these two measures available for all 93 programs, it is likely that their reported means would be appreciably lower (and that some of the correlations of these measures with others would be higher).

Intercorrelations among the 16 measures (Pearson product-moment coefficients) are given in Table 4.3. Of particular note are the high positive correlations of the reputational survey results with the total number of FY1976-80 program graduates (measure 02) and the total number of 1978-80 articles by program faculty (measure 17). Figure 4.1 illustrates the relation between the mean rating of the scholarly quality of faculty (measure 08) and the number of faculty members (measure 01) for each of 93 programs in economics. Figure 4.2 plots the mean rating of program effectiveness (measure 09) against the total number of FY1976-80 program graduates (measure 02). Although in both figures there is a significant positive correlation between program size and reputational rating, it is quite apparent that some of the smaller programs received high mean ratings and that some of the larger programs received low mean ratings.

Table 4.4 describes the 185 faculty members who participated in the evaluation of economics programs. These individuals constituted 66 percent of those asked to respond to the survey in this discipline and 9 percent of the faculty population in the 93 research-doctorate programs being evaluated.[4] A majority of the survey participants had earned their highest degree prior to 1970, and more than half held the rank of full professor.

To assist the reader in interpreting results of the survey evaluations, estimated standard errors have been computed for mean ratings of the scholarly quality of faculty in 93 economics programs (and are given in Table 4.1). For each program the mean rating and an associated "confidence interval" of 1.5 standard errors are illustrated in Figure 4.3 (listed in order of highest to lowest mean rating). In comparing two programs, if their confidence intervals do not overlap, one may conclude that there is a significant difference in their mean ratings at a .05 level of significance.[5] From this figure it is also apparent that one should have somewhat more confidence in the accuracy

of the mean ratings of higher-rated programs than lower-rated programs. This generalization results primarily from the fact that evaluators are not as likely to be familiar with the less prestigious programs, and consequently the mean ratings of these programs are usually based on fewer survey responses.

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[4] See Table 2.3 in Chapter II.

[5] See pp. 30-32 for a discussion of the interpretation of mean ratings and associated confidence intervals.

TABLE 4.1 Program Measures (Raw and Standardized Values) in Economics

Prog No.	University - Department/Academic Unit	Program Size (01)	(02)	(03)	Characteristics of Program Graduates (04)	(05)	(06)	(07)
001.	American University	16	20	140	.17	9.5	.79	.04
	Economics	*43*	*43*	*66*	*46*	*31*	*51*	*35*
002.	Arkansas, University-Fayetteville	19	26	15	.12	7.5	.83	.21
	Economics	*46*	*45*	*38*	*42*	*48*	*55*	*47*
003.	Boston College	21	23	69	.16	7.3	.80	.24
	Economics	*48*	*44*	*50*	*46*	*50*	*52*	*49*
004.	Boston University	38	25	80	.11	9.7	.80	.00
	Economics	*65*	*44*	*53*	*41*	*30*	*52*	*32*
005.	Brown University	15	34	50	.19	6.6	.70	.38
	Economics	*42*	*48*	*46*	*48*	*56*	*43*	*58*
006.	CUNY-Graduate School	13	40	57	.22	8.8	.56	.17
	Economics	*40*	*50*	*48*	*51*	*37*	*29*	*44*
007.	California Institute of Technology	19	10	18	NA	NA	NA	NA
	*Economics**	*46*	*39*	*39*				
008.	California, University of-Berkeley	26	118	135	.28	7.0	.85	.38
	Economics	*53*	*78*	*65*	*56*	*52*	*57*	*58*
009.	California, University of-Davis	26	33	61	.19	6.0	.85	.46
	Agricultural Economics	*53*	*47*	*48*	*49*	*61*	*56*	*64*
010.	California, University of-Davis	19	23	61	.22	6.7	.83	.11
	Economics	*46*	*44*	*48*	*51*	*55*	*55*	*40*
011.	California, University of-Los Angeles	27	73	118	.14	7.0	.75	.35
	Economics	*54*	*62*	*61*	*44*	*52*	*47*	*56*
012.	California, University of-Riverside	10	17	33	.07	7.0	.73	.20
	Economics	*36*	*42*	*42*	*37*	*52*	*46*	*46*
013.	California, University of-San Diego	20	19	56	.33	6.5	.56	.28
	Economics	*47*	*42*	*47*	*61*	*56*	*29*	*51*
014.	California, University of-Santa Barbara	25	30	51	.13	7.3	.73	.13
	Economics	*52*	*46*	*46*	*43*	*50*	*46*	*41*
015.	Carnegie-Mellon University	17	13	22	.43	5.5	.94	.75
	Industrial Administration	*44*	*40*	*40*	*70*	*65*	*65*	*84*
016.	Case Western Reserve University	10	12	16	.42	9.9	.73	.18
	Economics	*36*	*40*	*38*	*69*	*28*	*45*	*45*
017.	Chicago, University of	27	121	120	.37	7.0	.93	.44
	Economics	*54*	*79*	*62*	*65*	*53*	*64*	*63*
018.	Cincinnati, University of	16	29	53	.08	7.3	.68	.12
	Economics	*43*	*46*	*47*	*38*	*50*	*40*	*41*
019.	Claremont Graduate School	19	28	50	.27	8.9	.74	.06
	Economics	*46*	*46*	*46*	*56*	*36*	*46*	*36*
020.	Clark University	9	14	35	.26	7.0	.94	.28
	Economics	*35*	*40*	*43*	*55*	*52*	*66*	*51*

* indicates program was initiated since 1970.

NOTE: On the first line of data for every program, raw values for each measure are reported; on the second line values are reported in standardized form, with mean = 50 and standard deviation = 10. "NA" indicates that the value for a measure is not available.

TABLE 4.1 Program Measures (Raw and Standardized Values) in Economics

Prog	Survey Results				University Library	Research Support		Published Articles		Survey Ratings Standard Error			
No.	(08)	(09)	(10)	(11)	(12)	(13)	(14)	(17)	(18)	(08)	(09)	(10)	(11)
001.	1.3	0.7	1.1	0.5	NA	.06	74	12	.31	.11	.11	.08	.06
	42	40	49	42		46	41	40	29				
002.	0.7	0.3	NA	0.2	NA	.00	1043	13	.42	.09	.09	NA	.04
	36	33		36		42	52	40	37				
003.	1.8	1.1	1.2	0.8	NA	.14	NA	33	.48	.11	.09	.09	.06
	46	47	51	48		52		45	40				
004.	2.3	1.4	1.5	0.8	-0.4	.05	350	24	.29	.09	.09	.09	.06
	50	50	63	49	45	45	44	43	28				
005.	3.4	2.0	1.0	1.5	-1.1	.40	108	33	.67	.08	.06	.06	.06
	59	60	44	63	38	71	42	45	53				
006.	1.6	0.9	0.9	0.5	NA	.00	280	10	.39	.11	.09	.11	.06
	44	43	43	43		42	44	39	34				
007.	3.0	1.9	1.5	1.1	NA	.42	NA	65	.84	.09	.07	.08	.07
	56	59	64	55		73		53	64				
008.	4.1	2.3	0.4	1.6	2.2	.19	2612	67	.69	.07	.06	.06	.05
	65	65	22	65	70	56	71	54	54				
009.	2.6	1.9	1.1	0.3	0.6	.00	1063	77	.73	.22	.13	.13	.06
	53	59	48	39	55	42	53	56	57				
010.	2.4	1.3	1.2	0.9	0.6	.11	1063	60	.84	.08	.07	.08	.05
	51	50	51	49	55	49	53	52	64				
011.	4.1	2.1	1.4	1.8	2.0	.22	1117	64	.70	.06	.07	.06	.04
	65	62	60	68	68	58	53	53	55				
012.	1.1	0.5	0.5	0.5	-1.0	.00	NA	33	.80	.10	.09	.11	.06
	40	37	28	42	39	42		45	61				
013.	3.2	1.8	1.7	1.2	-0.0	.25	NA	31	.60	.08	.07	.06	.07
	58	57	71	56	48	60		45	48				
014.	2.2	1.3	1.4	0.9	-0.1	.00	5	78	.64	.09	.08	.09	.06
	49	49	61	50	48	42	40	56	51				
015.	3.1	2.1	0.8	1.2	NA	.47	585	54	.82	.08	.07	.08	.07
	57	62	37	55		77	47	50	63				
016.	0.5	0.4	0.7	0.2	-1.3	.10	NA	12	.50	.09	.09	.10	.04
	35	35	35	36	36	49		40	42				
017.	4.8	2.7	1.0	1.9	0.9	.22	617	94	.70	.04	.05	.06	.03
	72	72	44	70	57	58	48	60	55				
018.	1.0	0.6	1.0	0.2	-0.2	.06	NA	17	.56	.11	.14	.09	.04
	39	38	44	37	46	46		41	46				
019.	2.0	1.3	1.1	0.6	NA	.00	NA	25	.37	.10	.11	.12	.06
	48	49	48	45		42		43	33				
020.	0.6	0.5	0.9	0.3	NA	NA	18	9	NA	.10	.09	.07	.05
	36	36	41	38			41	39					

NOTE: On the first line of data for every program, raw values for each measure are reported; on the second line values are reported in standardized form, with mean = 50 and standard deviation = 10. "NA" indicates that the value for a measure is not available.

TABLE 4.1 Program Measures (Raw and Standardized Values) in Economics

Prog No.	University - Department/Academic Unit	Program Size (01)	(02)	(03)	Characteristics of Program Graduates (04)	(05)	(06)	(07)
021.	Colorado State University-Fort Collins	39	28	22	.18	8.3	.78	.33
	Economics	*66*	*46*	*40*	*47*	*42*	*50*	*55*
022.	Colorado, University of	20	62	15	.16	6.7	.71	.16
	Economics	*47*	*58*	*38*	*46*	*55*	*43*	*44*
023.	Columbia University	28	53	213	.21	7.6	.84	.26
	Economics	*55*	*54*	*82*	*50*	*48*	*56*	*50*
024.	Connecticut, University of-Storrs	19	32	45	.27	9.1	.73	.06
	Economics	*46*	*47*	*45*	*56*	*35*	*45*	*37*
025.	Cornell University-Ithaca	24	55	67	.23	6.2	.84	.32
	Economics	*51*	*55*	*50*	*52*	*59*	*56*	*55*
026.	Duke University	22	57	60	.40	6.7	.80	.21
	Economics	*49*	*56*	*48*	*68*	*55*	*52*	*47*
027.	Florida State University-Tallahassee	16	28	60	.27	7.3	.78	.19
	Economics	*43*	*46*	*48*	*56*	*50*	*50*	*45*
028.	Florida, University of-Gainesville	20	22	32	.12	5.4	.64	.04
	Economics	*47*	*43*	*42*	*42*	*66*	*37*	*35*
029.	Fordham University	14	14	57	.14	9.5	.62	.08
	Economics	*41*	*40*	*48*	*44*	*31*	*34*	*38*
030.	George Washington University	24	51	157	.09	9.3	.61	.00
	Economics	*51*	*54*	*70*	*39*	*34*	*34*	*32*
031.	Georgetown University	15	18	47	.05	8.8	.70	.05
	Economics	*42*	*42*	*45*	*36*	*37*	*42*	*36*
032.	Georgia State University-Atlanta	20	25	46	.12	9.1	.84	.16
	Economics	*47*	*44*	*45*	*42*	*35*	*56*	*43*
033.	Harvard University	34	123	130	.37	6.7	.91	.46
	Economics	*61*	*80*	*64*	*64*	*55*	*62*	*64*
034.	Hawaii, University of	21	36	70	.09	7.0	.78	.16
	*Economics**	*48*	*48*	*50*	*39*	*52*	*50*	*43*
035.	Illinois, University-Urbana/Champaign	56	77	98	.15	5.4	.87	.40
	Economics	*83*	*63*	*57*	*45*	*66*	*59*	*60*
036.	Indiana University-Bloomington	21	53	66	.26	8.9	.88	.23
	Economics	*48*	*54*	*50*	*55*	*36*	*59*	*48*
037.	Iowa State University-Ames	32	99	122	.10	6.2	.70	.33
	Economics	*59*	*71*	*62*	*41*	*59*	*42*	*55*
038.	Iowa, University of-Iowa City	23	21	36	.25	6.3	.83	.42
	Economics	*50*	*43*	*43*	*54*	*58*	*55*	*61*
039.	Johns Hopkins University	7	51	41	.26	6.2	.89	.24
	Political Economy	*33*	*54*	*44*	*54*	*59*	*60*	*49*
040.	Kansas, University of	17	8	32	.30	6.3	.70	.40
	Economics	*44*	*38*	*42*	*58*	*59*	*42*	*60*

* indicates program was initiated since 1970.

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TABLE 4.1 Program Measures (Raw and Standardized Values) in Economics

Prog No.	Survey Results				University Library	Research Support		Published Articles		Survey Ratings Standard Error			
	(08)	(09)	(10)	(11)	(12)	(13)	(14)	(17)	(18)	(08)	(09)	(10)	(11)
021.	1.2	0.7	1.1	0.3	-1.1	.00	1064	62	.49	.12	.12	.09	.05
	41	*40*	*49*	*38*	*38*	*42*	*53*	*52*	*41*				
022.	1.6	1.1	0.9	0.5	-0.9	.10	132	41	.70	.12	.11	.10	.06
	44	*46*	*42*	*43*	*40*	*49*	*42*	*47*	*55*				
023.	4.2	2.1	1.4	1.7	1.7	.21	2992	72	.71	.06	.06	.07	.05
	66	*62*	*59*	*65*	*66*	*57*	*75*	*55*	*56*				
024.	1.4	0.8	1.2	0.5	-0.5	.00	108	14	.42	.09	.11	.08	.05
	43	*42*	*53*	*42*	*44*	*42*	*42*	*40*	*37*				
025.	3.2	1.8	1.3	1.3	1.6	.29	1591	42	.71	.06	.05	.07	.06
	57	*57*	*56*	*59*	*64*	*63*	*59*	*47*	*55*				
026.	3.0	1.8	1.4	1.3	0.3	.18	99	90	.77	.06	.06	.07	.06
	56	*58*	*60*	*58*	*52*	*55*	*42*	*59*	*60*				
027.	1.5	1.0	1.0	0.5	-0.4	.00	165	21	.69	.11	.08	.08	.06
	43	*45*	*45*	*42*	*45*	*42*	*42*	*42*	*54*				
028.	2.2	1.2	1.6	0.9	0.8	.05	396	52	.85	.09	.09	.08	.06
	49	*47*	*67*	*51*	*56*	*45*	*45*	*50*	*65*				
029.	0.6	0.4	1.1	0.2	NA	.00	NA	4	.14	.11	.11	.12	.05
	35	*35*	*49*	*37*		*42*		*38*	*18*				
030.	1.7	1.0	1.1	0.7	NA	.04	200	34	.50	.09	.09	.08	.06
	45	*45*	*49*	*47*		*45*	*43*	*45*	*42*				
031.	1.0	0.7	1.0	0.3	-0.6	.00	NA	15	.47	.11	.10	.07	.05
	39	*40*	*44*	*38*	*43*	*42*		*41*	*40*				
032.	1.2	0.7	1.1	0.4	MA	.00	NA	22	.50	.12	.11	.12	.06
	41	*40*	*48*	*40*		*42*		*42*	*42*				
033.	4.9	2.4	1.0	1.9	3.0	.27	1647	197	.79	.03	.07	.07	.03
	72	*67*	*45*	*70*	*78*	*61*	*59*	*86*	*61*				
034.	1.0	0.6	1.0	0.2	-0.1	.00	436	34	.76	.11	.11	.09	.04
	39	*39*	*44*	*37*	*47*	*42*	*45*	*45*	*59*				
035.	2.8	1.6	0.9	1.1	2.0	.13	2858	158	.75	.08	.08	.08	.05
	54	*54*	*42*	*55*	*68*	*51*	*73*	*76*	*58*				
036.	1.9	1.2	0.8	0.7	0.9	.10	49	23	.67	.10	.10	.07	.06
	46	*48*	*38*	*46*	*58*	*49*	*41*	*43*	*53*				
037.	2.4	1.8	0.8	0.8	-0.5	.13	1795	92	.69	.09	.08	.10	.06
	51	*57*	*40*	*47*	*44*	*51*	*61*	*60*	*54*				
038.	2.1	1.3	1.5	0.9	0.3	.09	51	26	.61	.08	.08	.08	.06
	48	*50*	*65*	*50*	*51*	*48*	*41*	*43*	*49*				
039.	3.1	1.9	0.6	1.4	-0.4	NA	28	12	NA	.11	.08	.07	.06
	57	*59*	*31*	*60*	*45*		*41*	*40*					
040.	1.4	0.8	0.8	0.5	0.1	.00	315	10	.35	.11	.10	.11	.06
	42	*42*	*38*	*42*	*50*	*42*	*44*	*39*	*32*				

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TABLE 4.1 Program Measures (Raw and Standardized Values) in Economics

Prog No.	University - Department/Academic Unit	Program Size			Characteristics of Program Graduates			
		(01)	(02)	(03)	(04)	(05)	(06)	(07)
041.	Kentucky, University of	17	30	46	.19	6.4	.89	.30
	Economics	*44*	*46*	*45*	*48*	*57*	*60*	*53*
042.	Maryland, University of-College Park	40	45	213	.14	8.3	.77	.20
	Economics	*67*	*52*	*82*	*44*	*42*	*49*	*46*
043.	Massachusetts Institute of Technology	37	129	129	.63	5.6	.91	.53
	Economics	*64*	*82*	*64*	*88*	*64*	*62*	*68*
044.	Massachusetts, University of-Amherst	25	20	94	.16	7.7	.42	.11
	Economics	*52*	*43*	*56*	*45*	*47*	*16*	*40*
045.	Michigan State University-East Lansing	29	40	52	.06	8.0	.74	.24
	Economics	*56*	*50*	*46*	*37*	*44*	*46*	*49*
046.	Michigan, University of-Ann Arbor	45	82	143	.36	6.6	.85	.30
	Economics	*72*	*65*	*67*	*64*	*56*	*57*	*53*
047.	Minnesota, University of	33	71	100	.20	8.2	.80	.39
	Economics	*60*	*61*	*57*	*49*	*43*	*52*	*59*
048.	Missouri, University of-Columbia	15	21	42	.29	7.0	.79	.33
	Economics	*42*	*43*	*44*	*57*	*52*	*51*	*55*
049.	Nebraska, University of-Lincoln	20	27	35	.07	7.8	.77	.17
	Economics	*47*	*45*	*43*	*37*	*46*	*49*	*44*
050.	New School for Social Research	11	43	214	.06	10.1	.61	.17
	Economics	*37*	*51*	*83*	*36*	*26*	*34*	*44*
051.	New York University	29	38	82	.05	8.3	.55	.05
	Economics	*56*	*49*	*53*	*36*	*42*	*28*	*36*
052.	North Carolina State University-Raleigh	44	41	45	.32	6.9	.90	.24
	Economics and Business	*71*	*50*	*45*	*60*	*53*	*62*	*49*
053.	North Carolina, University of-Chapel Hill	26	55	65	.18	6.3	.86	.42
	Economics	*53*	*55*	*49*	*48*	*58*	*57*	*61*
054.	Northern Illinois University-De Kalb	16	18	30	.06	9.5	.89	.11
	Economics	*43*	*42*	*41*	*36*	*31*	*60*	*40*
055.	Northwestern University	41	53	101	.41	5.6	.81	.36
	Economics	*68*	*54*	*57*	*68*	*64*	*53*	*57*
056.	Notre Dame, University of	12	31	60	.19	5.8	.59	.17
	Economics	*38*	*47*	*48*	*48*	*62*	*32*	*44*
057.	Ohio State University-Columbus	24	30	77	.12	6.3	.82	.35
	Economics	*51*	*46*	*52*	*42*	*58*	*54*	*57*
058.	Oklahoma State University-Stillwater	23	35	26	NA	NA	NA	NA
	Agricultural Economics	*50*	*48*	*41*				
059.	Oklahoma State University-Stillwater	17	28	29	.26	7.0	.78	.28
	Economics and Finance	*44*	*46*	*41*	*55*	*52*	*50*	*51*
060.	Oklahoma, University of-Norman	15	20	23	.08	8.3	.63	.21
	Economics	*42*	*43*	*40*	*38*	*41*	*35*	*47*

* indicates program was initiated since 1970.

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TABLE 4.1 Program Measures (Raw and Standardized Values) in Economics

Prog No.	Survey Results				University Library	Research Support		Published Articles		Survey Ratings Standard Error			
	(08)	(09)	(10)	(11)	(12)	(13)	(14)	(17)	(18)	(08)	(09)	(10)	(11)
041.	1.5	0.8	1.0	0.5	-0.1	.00	NA	22	.53	.10	.09	.10	.06
	44	*41*	*46*	*43*	*48*	*42*		*42*	*44*				
042.	3.2	1.6	1.5	1.4	0.2	.13	1162	46	.65	.08	.07	.07	.06
	58	*54*	*65*	*60*	*50*	*51*	*54*	*48*	*52*				
043.	5.0	2.9	1.2	1.9	-0.3	.54	1731	161	.78	.00	.04	.05	.03
	73	*74*	*52*	*70*	*46*	*82*	*60*	*77*	*60*				
044.	2.3	1.2	0.9	1.1	-0.7	.00	370	37	.56	.10	.09	.08	.06
	50	*48*	*41*	*54*	*42*	*42*	*45*	*46*	*46*				
045.	2.9	1.7	1.3	1.1	0.3	.03	2812	119	.69	.08	.07	.07	.07
	55	*56*	*55*	*54*	*52*	*44*	*73*	*67*	*54*				
046.	3.9	2.1	1.1	1.6	1.8	.27	1108	123	.80	.06	.06	.07	.06
	63	*63*	*51*	*64*	*66*	*61*	*53*	*68*	*61*				
047.	4.4	2.5	1.4	1.7	1.2	.24	1847	90	.67	.06	.05	.06	.05
	68	*68*	*61*	*65*	*60*	*60*	*62*	*59*	*53*				
048.	1.3	0.9	0.9	0.4	-0.2	.00	1670	31	.73	.12	.10	.06	.06
	42	*42*	*42*	*41*	*47*	*42*	*60*	*45*	*57*				
049.	1.2	0.7	1.0	0.3	-0.5	.00	1204	39	.60	.12	.11	.07	.05
	40	*40*	*46*	*38*	*44*	*42*	*54*	*47*	*48*				
050.	1.4	0.8	0.9	0.8	NA	.00	NA	14	.55	.12	.10	.08	.06
	42	*41*	*41*	*49*		*42*		*40*	*45*				
051.	3.4	1.6	1.6	1.5	0.5	.14	747	75	.69	.07	.07	.07	.06
	60	*54*	*68*	*61*	*53*	*52*	*49*	*56*	*54*				
052.	1.9	1.3	0.9	0.5	NA	.02	NA	80	.64	.12	.11	.09	.06
	47	*50*	*43*	*43*		*43*		*57*	*51*				
053.	2.8	1.7	1.1	1.1	1.0	.15	265	90	.81	.08	.07	.06	.06
	54	*56*	*50*	*55*	*58*	*53*	*43*	*59*	*62*				
054.	0.7	0.3	0.7	0.2	NA	.00	181	28	.75	.09	.08	.12	.04
	36	*34*	*36*	*36*		*42*	*42*	*44*	*58*				
055.	4.1	2.2	1.5	1.8	0.3	.32	272	76	.68	.06	.05	.07	.04
	65	*64*	*64*	*67*	*52*	*65*	*44*	*56*	*54*				
056.	0.9	0.6	0.9	0.4	-1.3	.00	NA	30	1.00	.12	.09	.07	.06
	38	*39*	*41*	*41*	*36*	*42*		*44*	*74*				
057.	2.3	1.4	1.0	1.0	0.9	.17	1061	60	.75	.09	.07	.07	.06
	50	*51*	*46*	*52*	*57*	*54*	*53*	*52*	*58*				
058.	1.3	0.8	NA	0.2	-1.9	.00	389	37	.57	.19	.19	NA	.04
	42	*42*		*36*	*30*	*42*	*45*	*46*	*46*				
059.	1.4	1.0	1.0	0.6	-1.9	.00	389	12	.35	.11	.11	.05	.06
	43	*44*	*47*	*43*	*30*	*42*	*45*	*40*	*32*				
060.	0.8	0.6	1.0	0.3	-0.6	.00	468	27	.53	.09	.10	.07	.04
	38	*38*	*46*	*38*	*43*	*42*	*46*	*44*	*44*				

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TABLE 4.1 Program Measures (Raw and Standardized Values) in Economics

Prog No.	University - Department/Academic Unit	Program Size (01)	(02)	(03)	Characteristics of Program Graduates (04)	(05)	(06)	(07)
061.	Oregon, University of-Eugene	17	32	35	.13	6.6	.76	.17
	Economics	*44*	*47*	*43*	*43*	*56*	*48*	*44*
062.	Pennsylvania State University	24	26	42	.21	8.8	.73	.21
	Economics	*51*	*45*	*44*	*50*	*38*	*45*	*47*
063.	Pennsylvania, University of	41	87	148	.17	7.0	.83	.22
	Economics	*68*	*67*	*68*	*47*	*52*	*55*	*47*
064.	Pittsburgh, University of	23	54	61	.20	6.6	.84	.20
	Economics	*50*	*55*	*48*	*49*	*55*	*55*	*46*
065.	Princeton University	41	75	76	.32	6.3	.89	.39
	Economics	*68*	*62*	*52*	*60*	*58*	*60*	*59*
066.	Purdue University-West Lafayette	21	45	45	.27	5.3	.85	.40
	Economics	*48*	*52*	*45*	*55*	*66*	*57*	*60*
067.	Rice University	12	23	33	.20	6.4	.73	.27
	Economics	*38*	*44*	*42*	*49*	*57*	*46*	*51*
068.	Rochester, University of	15	38	59	.14	7.1	.78	.46
	Economics	*42*	*49*	*48*	*43*	*51*	*50*	*64*
069.	Rutgers, The State University-New Brunswick	35	27	71	.20	7.0	.92	.42
	Economics	*62*	*45*	*51*	*49*	*52*	*63*	*61*
070.	SUNY at Albany	16	34	67	.08	7.0	.74	.09
	Economics	*43*	*48*	*50*	*39*	*52*	*46*	*38*
071.	SUNY at Binghamton	20	27	61	.14	7.0	.89	.15
	Economics	*47*	*45*	*48*	*44*	*52*	*60*	*43*
072.	SUNY at Stony Brook	18	21	83	.14	5.2	.95	.67
	Economics	*45*	*43*	*53*	*44*	*67*	*66*	*78*
073.	South Carolina, University of-Columbia	16	15	29	.12	8.8	.77	.12
	Economics	*43*	*41*	*41*	*42*	*38*	*49*	*40*
074.	Southern California, University of	26	26	66	.17	8.8	.70	.15
	Economics	*53*	*45*	*50*	*47*	*38*	*42*	*43*
075.	Southern Illinois University-Carbondale	13	21	19	.17	6.8	.72	.11
	Economics	*40*	*43*	*39*	*46*	*54*	*44*	*40*
076.	Southern Methodist University	13	25	30	.14	8.2	.67	.14
	Economics	*40*	*44*	*41*	*44*	*43*	*39*	*42*
077.	Stanford University	32	81	131	.23	7.6	.87	.29
	Economics	*59*	*65*	*64*	*52*	*47*	*59*	*52*
078.	Syracuse University	17	26	55	.18	6.7	.74	.37
	Economics	*44*	*45*	*47*	*47*	*55*	*46*	*58*
079.	Texas A & M University	24	52	58	.18	5.9	.77	.35
	Economics	*51*	*54*	*48*	*47*	*62*	*49*	*57*
080.	Texas, University of-Austin	29	24	84	.15	9.0	.75	.20
	Economics	*56*	*44*	*54*	*45*	*36*	*47*	*46*

* indicates program was initiated since 1970.

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TABLE 4.1 Program Measures (Raw and Standardized Values) in Economics

Prog	Survey Results				University Library	Research Support		Published Articles		Survey Ratings Standard Error			
No.	(08)	(09)	(10)	(11)	(12)	(13)	(14)	(17)	(18)	(08)	(09)	(10)	(11)
061.	1.7	1.2	1.1	0.5	-0.9	.00	NA	19	.53	.11	.10	.08	.06
	45	*48*	*49*	*43*	*40*	*42*		*42*	*44*				
062.	2.0	1.2	1.1	0.6	0.7	.08	1751	80	.75	.09	.09	.07	.06
	47	*47*	*48*	*45*	*56*	*48*	*61*	*57*	*58*				
063.	4.3	2.2	1.4	1.8	0.7	.51	1578	136	.76	.07	.06	.07	.04
	67	*64*	*61*	*67*	*55*	*80*	*59*	*71*	*58*				
064.	2.1	1.3	1.1	0.8	0.1	.00	25	42	.57	.08	.07	.07	.06
	48	*50*	*49*	*49*	*49*	*42*	*41*	*47*	*46*				
065.	4.8	2.6	1.6	1.8	0.9	.20	733	138	.66	.04	.05	.06	.04
	71	*70*	*67*	*68*	*57*	*56*	*49*	*71*	*52*				
066.	2.5	1.6	0.8	0.9	-0.5	.05	3348	35	.48	.08	.07	.07	.07
	51	*54*	*37*	*50*	*44*	*45*	*79*	*46*	*40*				
067.	1.7	1.2	0.7	0.7	-1.4	.00	NA	26	.58	.10	.09	.07	.07
	45	*47*	*36*	*46*	*35*	*42*		*43*	*47*				
068.	3.9	2.3	1.1	1.6	-0.6	.20	NA	57	.53	.08	.06	.07	.06
	64	*65*	*49*	*64*	*43*	*56*		*51*	*44*				
069.	1.8	1.0	1.1	0.7	0.8	.00	800	70	.66	.09	.09	.09	.07
	46	*44*	*50*	*47*	*56*	*42*	*50*	*54*	*52*				
070.	1.1	0.8	1.2	0.4	-1.0	.13	NA	31	.69	.11	.10	.11	.06
	40	*41*	*54*	*41*	*39*	*51*		*45*	*54*				
071.	1.6	1.0	1.0	0.6	NA	.00	56	20	.55	.09	.10	.11	.05
	44	*44*	*46*	*44*		*42*	*41*	*42*	*45*				
072.	2.3	1.4	1.5	1.0	-0.6	.22	92	21	.61	.09	.08	.09	.06
	50	*50*	*63*	*52*	*42*	*58*	*41*	*42*	*49*				
073.	1.3	0.6	1.5	0.4	-0.4	.00	NA	19	.56	.10	.11	.10	.05
	42	*39*	*63*	*40*	*45*	*42*		*42*	*46*				
074.	2.7	1.4	1.8	1.1	0.4	.15	137	75	.65	.08	.08	.05	.06
	54	*51*	*76*	*54*	*52*	*53*	*42*	*56*	*52*				
075.	0.6	0.3	0.9	0.3	-0.2	.00	96	13	.46	.10	.09	.12	.05
	35	*34*	*43*	*39*	*47*	*42*	*41*	*40*	*39*				
076.	1.9	1.1	1.1	0.7	NA	.00	NA	34	.77	.11	.10	.12	.06
	46	*47*	*50*	*46*		*42*		*45*	*59*				
077.	4.8	2.6	1.6	1.8	2.0	.28	1011	121	.94	.04	.05	.06	.04
	72	*70*	*69*	*68*	*68*	*62*	*52*	*67*	*70*				
078.	1.8	1.3	1.1	0.7	-0.3	.06	171	17	.59	.13	.11	.08	.07
	45	*49*	*49*	*46*	*45*	*46*	*42*	*41*	*47*				
079.	2.5	1.5	1.3	1.0	-0.5	.17	1361	58	.75	.09	.08	.08	.06
	52	*53*	*56*	*52*	*44*	*54*	*56*	*51*	*58*				
080.	2.2	1.2	1.1	0.9	1.6	.17	760	62	.62	.08	.08	.07	.06
	49	*48*	*48*	*50*	*64*	*54*	*49*	*52*	*50*				

NOTE: On the first line of data for every program, raw values for each measure are reported; on the second line values are reported in standardized form, with mean = 50 and standard deviation = 10. "NA" indicates that the value for a measure is not available.

TABLE 4.1 Program Measures (Raw and Standardized Values) in Economics

Prog No.	University - Department/Academic Unit	Program Size			Characteristics of Program Graduates			
		(01)	(02)	(03)	(04)	(05)	(06)	(07)
081.	Tulane University	11	14	16	.47	5.2	.94	.59
	Economics	*37*	*40*	*38*	*74*	*67*	*65*	*73*
082.	Utah, University of-Salt Lake City	21	23	60	.10	6.8	.70	.20
	Economics	*48*	*44*	*48*	*40*	*54*	*42*	*46*
083.	Vanderbilt University	23	39	49	.22	7.6	.75	.11
	Economics and Business Administration	*50*	*49*	*46*	*51*	*48*	*47*	*40*
084.	Virginia Polytechnic Institute & State Univ	15	46	50	.16	5.7	.79	.35
	Economics	*42*	*52*	*46*	*46*	*63*	*51*	*56*
085.	Virginia, University of	30	34	60	.42	7.5	.93	.40
	Economics	*57*	*48*	*48*	*69*	*48*	*64*	*60*
086.	Washington State University-Pullman	19	21	37	.26	8.5	.91	.39
	Economics	*46*	*43*	*43*	*55*	*40*	*63*	*59*
087.	Washington University-Saint Louis	20	46	53	.44	7.4	.87	.31
	Economics	*47*	*52*	*47*	*70*	*49*	*58*	*54*
088.	Washington, University of-Seattle	30	31	57	.29	7.3	.79	.32
	Economics	*57*	*47*	*48*	*57*	*50*	*51*	*54*
089.	Wayne State University	21	23	25	.25	7.8	.60	.08
	Economics	*48*	*44*	*40*	*54*	*45*	*33*	*38*
090.	West Virginia University	24	18	72	.15	7.3	.85	.15
	Business and Economics	*51*	*42*	*51*	*45*	*50*	*57*	*43*
091.	Wisconsin, University of-Madison	45	126	172	.41	6.1	.86	.35
	Economics	*72*	*81*	*73*	*68*	*60*	*58*	*56*
092.	Wisconsin, University of-Milwaukee	17	13	24	.08	8.3	.64	.14
	Economics	*44*	*40*	*40*	*38*	*42*	*37*	*42*
093.	Yale University	51	99	147	.21	6.2	.90	.41
	Economics	*78*	*71*	*68*	*50*	*59*	*62*	*60*

* indicates program was initiated since 1970.

NOTE: On the first line of data for every program, raw values for each measure are reported; on the second line values are reported in standardized form, with mean = 50 and standard deviation = 10. "NA" indicates that the value for a measure is not available.

TABLE 4.1 Program Measures (Raw and Standardized Values) in Economics

Prog No.	Survey Results				University Library	Research Support		Published Articles		Survey Ratings Standard Error			
	(08)	(09)	(10)	(11)	(12)	(13)	(14)	(17)	(18)	(08)	(09)	(10)	(11)
081.	1.8	1.0	1.3	0.8	-1.0	.09	NA	21	.82	.11	.10	.11	.07
	45	45	58	48	39	48		42	63				
082.	1.4	0.8	1.2	0.4	-0.6	.00	NA	20	.43	.11	.09	.09	.05
	42	42	51	40	43	42		42	37				
083.	2.4	1.4	1.0	0.9	-0.7	.04	NA	58	.74	.09	.08	.08	.06
	51	51	45	51	42	45		51	57				
084.	2.9	1.6	1.3	1.4	-0.0	.47	829	69	.73	.09	.08	.08	.06
	55	55	55	59	48	76	50	54	57				
085.	3.0	1.7	1.4	1.2	0.7	.17	263	83	.53	.08	.06	.08	.06
	56	56	59	57	56	54	43	58	44				
086.	1.0	0.6	1.3	0.3	-0.3	.11	51	26	.53	.15	.13	.16	.05
	39	38	58	38	46	49	41	43	43				
087.	2.7	1.6	1.0	1.1	-0.4	.10	NA	34	.70	.07	.07	.06	.06
	53	54	44	55	45	49		45	55				
088.	2.9	1.8	1.3	1.2	1.5	.10	248	78	.73	.08	.07	.07	.06
	55	57	56	56	63	49	43	56	57				
089.	1.8	1.1	1.1	0.8	-0.4	.00	190	27	.48	.09	.10	.08	.06
	46	47	49	49	45	42	43	44	40				
090.	1.1	0.7	1.0	0.4	NA	.04	714	30	.33	.11	.13	.09	.05
	39	41	47	40		45	49	44	31				
091.	4.1	2.3	1.5	1.8	1.6	.36	3388	142	.80	.05	.06	.07	.04
	65	66	63	67	64	68	80	72	61				
092.	1.4	0.8	1.2	0.6	NA	.06	32	32	.59	.10	.09	.08	.05
	43	41	53	44		46	41	45	47				
093.	4.7	2.5	0.9	1.8	2.1	.33	1245	145	.65	.05	.06	.06	.04
	71	68	43	69	69	66	55	73	51				

NOTE: On the first line of data for every program, raw values for each measure are reported; on the second line values are reported in standardized form, with mean = 50 and standard deviation = 10. "NA" indicates that the value for a measure is not available.

TABLE 4.2 Summary Statistics Describing Each Program Measure--Economics

Measure	Number of Programs Evaluated	Mean	Standard Deviation	DECILES								
				1	2	3	4	5	6	7	8	9
Program Size												
01 Raw Value	93	23	10	13	16	17	19	21	23	26	29	39
Std Value	93	50	10	40	43	44	46	48	50	53	56	66
02 Raw Value	93	41	28	16	21	23	27	30	35	45	53	80
Std Value	93	50	10	41	43	44	45	46	48	52	54	64
03 Raw Value	93	68	45	23	33	42	50	57	61	70	96	134
Std Value	93	50	10	40	42	44	46	48	48	50	56	65
Program Graduates												
04 Raw Value	91	.21	.11	.08	.12	.14	.16	.18	.21	.25	.28	.37
Std Value	91	50	10	38	42	44	45	47	50	54	56	65
05 Raw Value	91	7.3	1.2	9.1	8.5	7.8	7.3	7.0	6.9	6.6	6.3	5.8
Std Value	91	50	10	35	40	46	50	52	53	56	58	62
06 Raw Value	91	.78	.11	.62	.70	.73	.76	.79	.82	.84	.87	.91
Std Value	91	50	10	35	43	45	48	51	54	55	58	62
07 Raw Value	91	.26	.15	.08	.12	.17	.20	.23	.28	.34	.38	.42
Std Value	91	50	10	38	41	44	46	48	51	55	58	61
Survey Results												
08 Raw Value	93	2.3	1.2	1.0	1.3	1.4	1.8	2.1	2.4	2.8	3.2	4.1
Std Value	93	50	10	39	42	42	46	48	51	54	58	65
09 Raw Value	93	1.3	.6	.6	.7	.9	1.1	1.2	1.4	1.6	1.9	2.3
Std Value	93	50	10	38	40	43	46	48	51	54	59	65
10 Raw Value	91	1.1	.3	.8	.9	1.0	1.0	1.1	1.1	1.2	1.4	1.5
Std Value	91	50	10	38	42	46	46	49	49	53	60	64
11 Raw Value	93	.9	.5	.3	.4	.5	.6	.8	.9	1.1	1.4	1.7
Std Value	93	50	10	39	41	43	45	48	50	54	60	66
University Library												
12 Raw Value	75	.1	1.0	-1.1	-.6	-.5	-.4	-.1	.3	.7	.9	1.7
Std Value	75	50	10	38	43	44	45	48	52	55	57	65
Research Support												
13 Raw Value	91	.11	.13	.00	.00	.00	.04	.06	.10	.15	.21	.29
Std Value	91	50	10	42	42	42	45	46	49	53	58	64
14 Raw Value	69	832	863	51	106	187	301	452	776	1063	1404	1800
Std Value	69	50	10	41	42	43	44	46	49	53	57	61
Publication Records												
17 Raw Value	93	52	40	13	20	26	31	35	54	65	78	112
Std Value	93	50	10	40	42	43	45	46	50	53	56	65
18 Raw Value	91	.63	.15	.42	.50	.55	.59	.65	.69	.71	.75	.80
Std Value	91	50	10	36	41	45	47	51	54	55	58	61

NOTE: Standardized values reported in the preceding table have been computed from exact values of the mean and standard deviation and not the rounded values reported here.

TABLE 4.3 Intercorrelations Among Program Measures on 93 Programs in Economics

	Measure															
	01	02	03	04	05	06	07	08	09	10	11	12	13	14	17	18
Program Size																
01		.61	.53	.20	.17	.30	.23	.61	.58	.32	.55	.61	.39	.49	.79	.22
02			.63	.36	.29	.32	.33	.75	.74	.00	.71	.57	.54	.52	.76	.37
03				.05	-.06	.09	.07	.56	.50	.17	.59	.62	.38	.45	.47	.16
Program Graduates																
04					.33	.43	.52	.42	.46	.03	.40	.15	.45	.11	.32	.21
05						.35	.62	.36	.42	.01	.35	.06	.39	.25	.32	.47
06							.59	.31	.34	-.03	.25	.38	.35	.18	.33	.24
07								.48	.53	-.01	.44	.25	.54	.27	.38	.34
Survey Results																
08									.98	.35	.97	.67	.76	.44	.78	.47
09										.30	.93	.60	.76	.44	.75	.47
10											.36	.21	.31	-.05	.26	.12
11												.63	.78	.38	.72	.45
University Library																
12													.45	.41	.67	.41
Research Support																
13														.29	.60	.45
14															.54	.31
Publication Records																
17																.54
18																

NOTE: Since in computing correlation coefficients program data must be available for both of the measures being correlated, the actual number of programs on which each coefficient is based varies.

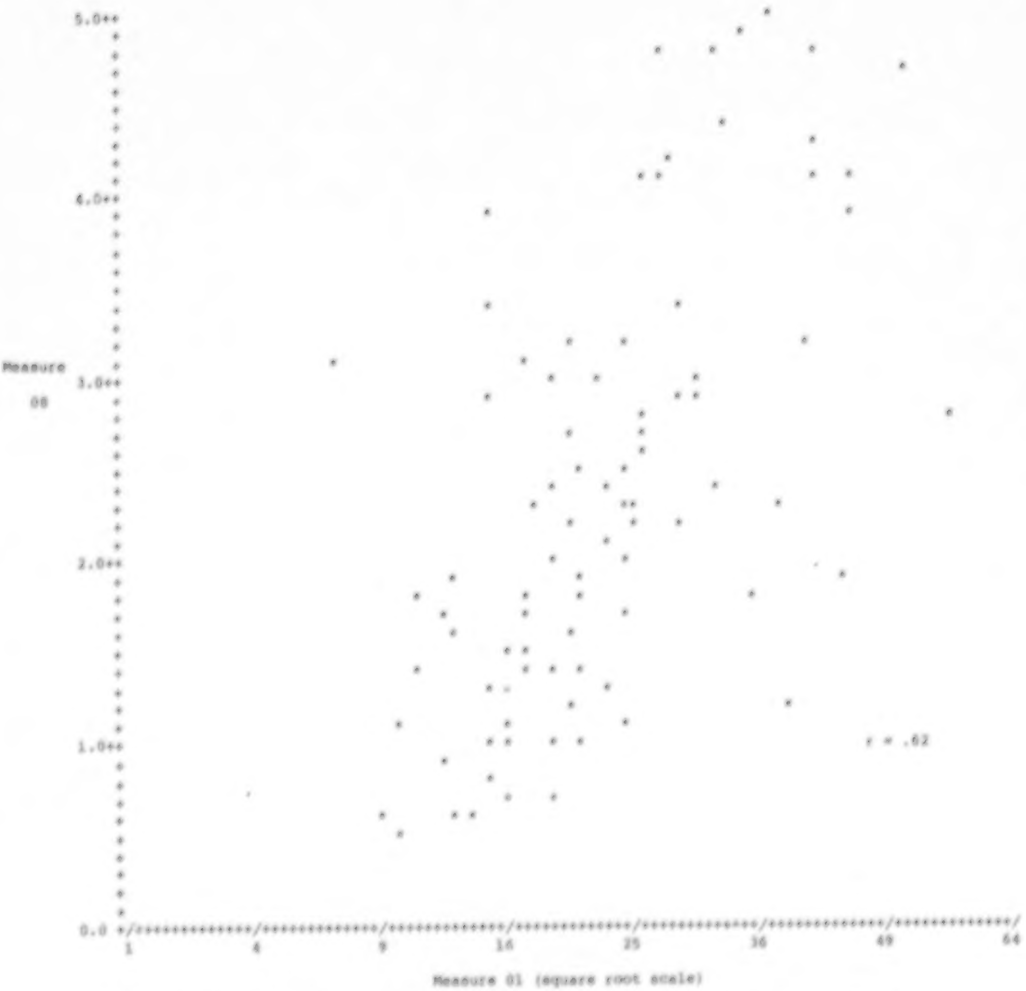

FIGURE 4.1 Mean rating of scholarly quality of faculty (measure 08) versus number of faculty members (measure 01)--93 programs in economics.

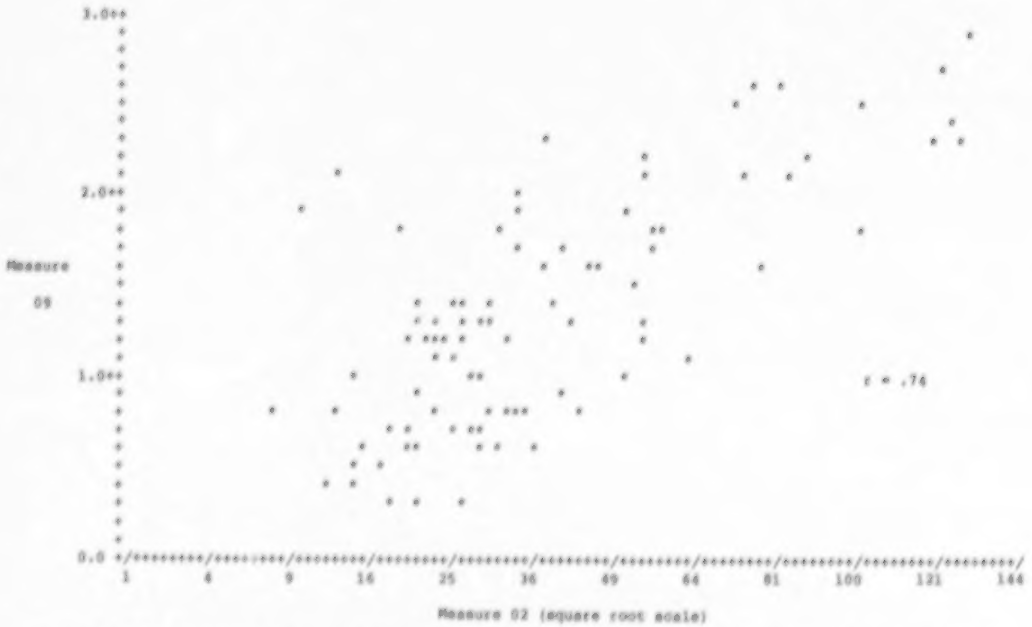

FIGURE 4.2 Mean rating of program effectiveness in educating research scholars/scientists (measure 09) versus number of graduates in last five years (measure 02)--93 programs in economics.

TABLE 4.4 Characteristics of Survey Participants in Economics

	Respondents	
	N	%
Field of Specialization		
Econometrics	17	9
Economics	155	84
Other/Unknown	13	7
Faculty Rank		
Professor	101	55
Associate Professor	52	28
Assistant Professor	32	17
Year of Highest Degree		
Pre-1950	7	4
1950-59	27	15
1960-69	68	37
Post-1969	82	44
Unknown	1	1
Evaluator Selection		
Nominated by Institution	167	90
Other	18	10
Survey Form		
With Faculty Names	169	91
Without Names	16	9
Total Evaluators	185	100

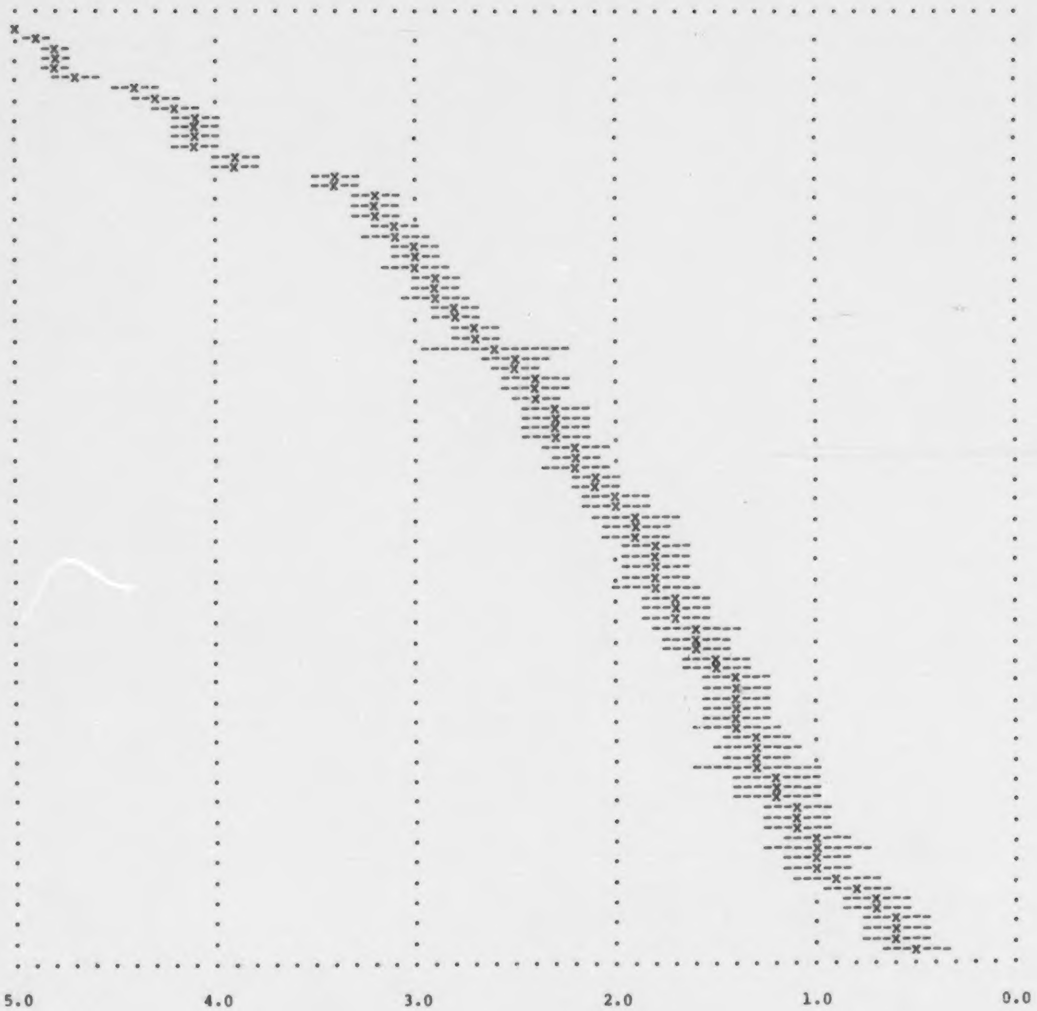

FIGURE 4.3 Mean rating of scholarly quality of faculty in 93 programs in economics.

NOTE: Programs are listed in sequence of mean rating, with the highest-rated program appearing at the top of the page. The broken lines (---) indicate a confidence interval of ±1.5 standard errors around the reported mean (x) of each program.

V

Geography Programs

In this chapter 49 research-doctorate programs in geography are assessed. These programs, according to the information supplied by their universities, have accounted for 762 doctoral degrees awarded during the FY1976-80 period.[1] On the average, 22 full-time and part-time students intending to earn doctorates were enrolled in a program in December 1980, with an average faculty size of 13 members.[2] Four programs were initiated since 1970, and no two programs are located in the same university. In addition to the 49 institutions represented in this discipline, another 3 were initially identified as meeting the criteria[3] for inclusion in the assessment:

Arizona State University--Tempe
Oklahoma State University--Stillwater
University of Pennsylvania

Geography programs at these three institutions have not been included in the evaluations in this discipline, since in each case the study coordinator either indicated that the institution did not at that time have a research-doctorate program in geography or failed to provide the information requested by the committee.

Before examining individual program results presented in Table 5.1, the reader is urged to refer to Chapter II, in which each of the 16 measures used in the assessment is discussed. Summary statistics describing every measure are given in Table 5.2. For nine of the measures, data are reported for at least 43 of the 49 geography programs. For measures 04-07, which pertain to characteristics of the program graduates, data are presented for only approximately three-fourths of the programs; the other fourth had too few graduates on which to base statistics.[4] As mentioned in Chapter II, data on the total university expenditures for research (measure 14) are not available in geography. With respect to measure 13, the fraction of faculty with research grants from the Alcohol, Drug Abuse, and Mental Health Administration, the National Institutes of Health, or the National Science Foundation, and measure 18, the fraction of program faculty with one or more published articles during the 1978-80 period, data are reported for approximately three-fourths of the geography programs.[5]

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[1] Data from the NRC's Survey of Earned Doctorates indicate that 728 research doctorates in geography were awarded by U.S. universities between FY1976 and FY1980. Since the NRC figure is based on field of degree and not department, it may exclude some doctorates included in the numbers reported by the institutional coordinators.

[2] See the reported means for measures 03 and 01 in Table 5.2.

[3] As mentioned in Chapter I, the primary criterion for inclusion was that a university had awarded at least 1 doctorate in geography during the FY1976-78 period.

Intercorrelations among the 15 measures (Pearson product-moment coefficients) are given in Table 5.3. Of particular note are the high positive correlations of reputational survey ratings (08, 09) with both the total number of 1978-80 articles by program faculty (measure 17) and the total number of FY1976-80 program graduates (measure 02). Figure 5.1 illustrates the relation between the mean rating of the scholarly quality of faculty (measure 08) and the number of faculty members (measure 01) for each of 49 programs in geography. Figure 5.2 plots the mean rating of program effectiveness (measure 09) against the total number of FY1976-80 program graduates (measure 02). Although in both figures there is a significant positive correlation between program size and reputational rating, it is quite apparent that some of the smaller programs received high mean ratings and that some of the larger programs received low mean ratings.

Table 5.4 describes the 106 faculty members who participated in the evaluation of geography programs. These individuals constituted 71 percent of those asked to respond to the survey in this discipline and 17 percent of the faculty population in the 49 research-doctorate programs being evaluated.[6] As mentioned in Chapter II, the timing and circumstances of the survey of evaluators in geography differed from the surveys of other disciplines since geography was added at a late date to the list of disciplines to be included in the assessment; survey forms were mailed to geographers in September 1981. More than three-fifths of the survey participants had earned their highest degree prior to 1970, and a majority held the rank of full professor.

To assist the reader in interpreting results of the survey evaluations, estimated standard errors have been computed for mean ratings of the scholarly quality of faculty in 49 geography programs (and are given in Table 5.1). For each program the mean rating and an associated "confidence interval" of 1.5 standard errors are illustrated in

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[4] As mentioned in Chapter II, data for measures 04-07 are not reported if they are based on the survey responses of fewer than 10 FY1975-79 program graduates.

[5] Data for measures 13 and 18 are not reported for any programs that had fewer than 10 faculty members.

[6] See Table 2.3 in Chapter II.

Figure 5.3 (listed in order of highest to lowest mean rating). In comparing two programs, if their confidence intervals do not overlap, one may conclude that there is a significant difference in their mean ratings at a .05 level of significance.[7] From this figure it is also apparent that one should have somewhat more confidence in the accuracy of the mean ratings of higher-rated programs than lower-rated programs. This generalization results primarily from the fact that evaluators are not as likely to be familiar with the less prestigious programs, and consequently the mean ratings of these programs are usually based on fewer survey responses.

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[7] See pp. 30-32 for a discussion of the interpretation of mean ratings and associated confidence intervals.

TABLE 5.1 Program Measures (Raw and Standardized Values) in Geography

Prog No.	University - Department/Academic Unit	Program Size (01)	Program Size (02)	Program Size (03)	Characteristics of Program Graduates (04)	Characteristics of Program Graduates (05)	Characteristics of Program Graduates (06)	Characteristics of Program Graduates (07)
001.	Arizona, University of-Tucson	11	1	12	NA	NA	NA	NA
	*Geography and Regional Development**	*46*	*34*	*44*				
002.	Boston University	13	5	23	NA	NA	NA	NA
	Geography	*50*	*38*	*50*				
003.	California, University of-Berkeley	13	29	36	.42	7.9	.74	.29
	Geography	*50*	*65*	*59*	*61*	*55*	*52*	*51*
004.	California, University of-Davis	8	5	18	NA	NA	NA	NA
	Geography	*39*	*38*	*47*				
005.	California, University of-Los Angeles	23	33	60	.31	8.1	.57	.29
	Geography	*71*	*69*	*74*	*54*	*54*	*39*	*51*
006.	California, University of-Riverside	5	10	8	.17	8.0	.58	.08
	Earth Sciences	*33*	*44*	*41*	*44*	*55*	*40*	*35*
007.	Chicago, University of	9	13	24	.43	10.5	.86	.43
	Geography	*41*	*47*	*51*	*62*	*37*	*60*	*62*
008.	Cincinnati, University of	8	11	12	.20	7.5	.50	.20
	Geography	*39*	*45*	*44*	*46*	*58*	*34*	*44*
009.	Clark University	21	37	37	.44	8.3	.94	.33
	Geography	*67*	*74*	*59*	*63*	*53*	*66*	*54*
010.	Colorado, University of	13	23	76	.15	6.8	.63	.26
	Geography	*50*	*58*	*84*	*43*	*63*	*43*	*49*
011.	Columbia University	12	9	39	NA	NA	NA	NA
	Geography	*48*	*43*	*61*				
012.	Denver, University of	5	4	2	NA	NA	NA	NA
	Geography	*33*	*37*	*37*				
013.	Florida, University of-Gainesville	18	12	14	.43	8.0	.53	.07
	Geography	*61*	*46*	*45*	*62*	*55*	*36*	*34*
014.	Georgia, University of-Athens	15	18	11	.17	8.8	.83	.33
	Geography	*54*	*53*	*43*	*44*	*49*	*58*	*54*
015.	Hawaii, University of	23	20	22	.13	12.5	.75	.13
	Geography	*71*	*55*	*50*	*41*	*23*	*52*	*38*
016.	Illinois, University-Urbana/Champaign	19	23	25	.39	7.6	.85	.52
	Geography	*63*	*58*	*52*	*59*	*57*	*60*	*69*
017.	Indiana State University-Terre Haute	19	7	23	.18	8.3	.55	.09
	Geography	*63*	*41*	*50*	*45*	*53*	*37*	*35*
018.	Indiana University-Bloomington	15	17	30	.00	7.5	.83	.33
	Geography	*54*	*52*	*55*	*32*	*58*	*58*	*54*
019.	Iowa, University of-Iowa City	10	21	25	.15	7.1	.54	.23
	Geography	*43*	*56*	*52*	*43*	*61*	*37*	*46*
020.	Johns Hopkins University	4	18	35	.25	6.3	.83	.17
	Geography and Environmental Engineering	*31*	*53*	*58*	*50*	*67*	*58*	*41*

* indicates program was initiated since 1970.

NOTE: On the first line of data for every program, raw values for each measure are reported; on the second line values are reported in standardized form, with mean = 50 and standard deviation = 10. "NA" indicates that the value for a measure is not available.

TABLE 5.1 Program Measures (Raw and Standardized Values) in Geography

Prog No.	Survey Results				University Library	Research Support		Published Articles		Survey Ratings Standard Error			
	(08)	(09)	(10)	(11)	(12)	(13)	(14)	(17)	(18)	(08)	(09)	(10)	(11)
001.	2.4	1.3	1.1	1.1	0.9	.09	NA	13	.55	.09	.08	.08	.06
	46	44	53	46	56	46		46	52				
002.	2.6	1.4	1.4	1.1	-0.4	.08	NA	18	.31	.10	.07	.08	.06
	48	46	64	48	42	44		51	37				
003.	4.2	2.4	1.0	1.6	2.2	.39	NA	23	.62	.09	.06	.07	.05
	66	67	50	64	70	72		55	57				
004.	2.3	1.3	1.1	0.9	0.6	NA	NA	23	NA	.10	.08	.06	.06
	45	43	54	42	53			55					
005.	4.0	2.2	1.3	1.6	2.0	.13	NA	42	.65	.09	.06	.06	.05
	64	63	61	64	68	49		73	59				
006.	1.5	1.1	0.6	0.8	-1.0	NA	NA	2	NA	.14	.10	.07	.07
	36	38	39	39	35			36					
007.	4.3	2.3	0.4	1.7	0.9	NA	NA	30	NA	.09	.06	.05	.05
	67	64	32	67	56			62					
008.	2.1	1.4	0.8	1.1	-0.2	NA	NA	4	NA	.10	.07	.07	.06
	43	45	44	47	43			38					
009.	3.8	2.2	1.0	1.6	NA	.14	NA	22	.33	.09	.06	.06	.05
	62	62	52	63		50		55	39				
010.	3.0	1.8	1.3	1.2	-0.9	.39	NA	19	.46	.08	.07	.07	.05
	53	54	61	51	37	72		52	47				
011.	2.1	1.2	0.6	0.9	1.7	.08	NA	4	.25	.09	.07	.07	.07
	42	42	39	43	65	45		38	33				
012.	1.2	0.9	1.0	0.7	NA	NA	NA	5	NA	.12	.10	.07	.07
	32	35	51	35				39					
013.	2.0	1.2	0.8	0.8	0.8	.06	NA	5	.22	.10	.08	.09	.07
	41	42	44	38	55	42		39	32				
014.	3.2	1.9	1.2	1.3	0.4	.13	NA	29	.80	.08	.07	.07	.06
	55	55	58	53	51	49		61	69				
015.	2.9	1.8	1.2	1.0	-0.1	.17	NA	27	.48	.10	.07	.06	.06
	52	54	58	46	45	53		59	48				
016.	3.4	2.0	1.6	1.5	2.0	.21	NA	37	.63	.08	.06	.07	.05
	58	59	68	61	67	56		68	58				
017.	1.6	1.0	1.0	0.7	NA	.05	NA	13	.26	.12	.09	.07	.06
	37	36	51	35		42		46	34				
018.	2.9	1.8	1.3	1.2	0.9	.13	NA	21	.53	.10	.07	.08	.06
	52	54	59	52	56	49		54	52				
019.	3.3	2.1	0.7	1.3	0.3	.30	NA	11	.50	.08	.06	.06	.06
	57	60	39	55	49	64		45	49				
020.	3.5	1.9	0.9	1.4	-0.4	NA	NA	15	NA	.12	.09	.06	.06
	59	56	46	56	42			48					

NOTE: On the first line of data for every program, raw values for each measure are reported; on the second line values are reported in standardized form, with mean = 50 and standard deviation = 10. "NA" indicates that the value for a measure is not available.

TABLE 5.1 Program Measures (Raw and Standardized Values) in Geography

Prog No.	University - Department/Academic Unit	Program Size			Characteristics of Program Graduates			
		(01)	(02)	(03)	(04)	(05)	(06)	(07)
021.	Kansas, University of	18	27	25	.27	10.9	.64	.33
	Geography and Meteorology	*61*	*63*	*52*	*51*	*34*	*44*	*54*
022.	Kent State University	10	13	20	.15	9.0	.69	.23
	Geography	*43*	*47*	*49*	*43*	*48*	*48*	*46*
023.	Kentucky, University of	11	7	7	NA	NA	NA	NA
	*Geography**	*46*	*41*	*40*				
024.	Louisiana State University-Baton Rouge	17	12	8	.18	7.3	.64	.55
	Geography and Anthropology	*58*	*46*	*41*	*45*	*59*	*44*	*71*
025.	Maryland, University of-College Park	15	9	60	NA	NA	NA	NA
	Geography	*54*	*43*	*74*				
026.	Michigan State University-East Lansing	17	29	34	.21	9.2	.82	.18
	Geography	*58*	*65*	*57*	*47*	*47*	*57*	*43*
027.	Michigan, University of-Ann Arbor	13	21	35	.50	6.8	.40	.25
	Geography	*50*	*56*	*58*	*67*	*63*	*26*	*48*
028.	Minnesota, University of	20	28	26	.38	8.8	.79	.29
	Geography	*65*	*64*	*52*	*59*	*49*	*55*	*51*
029.	Nebraska, University of-Lincoln	17	12	6	.36	9.0	.85	.39
	Geography	*58*	*46*	*40*	*57*	*48*	*59*	*59*
030.	North Carolina, University of-Chapel Hill	11	15	8	.14	11.5	.77	.08
	Geography	*46*	*49*	*41*	*42*	*30*	*53*	*34*
031.	Northern Colorado, University of-Greeley	8	7	4	NA	NA	NA	NA
	*Geography**	*39*	*41*	*38*				
032.	Northwestern University	5	8	4	NA	NA	NA	NA
	Geography	*33*	*42*	*38*				
033.	Ohio State University-Columbus	14	31	26	.14	6.3	.90	.59
	Geography	*52*	*67*	*52*	*42*	*67*	*63*	*74*
034.	Oklahoma, University of-Norman	12	22	41	.11	9.0	.65	.19
	Geography	*48*	*57*	*62*	*40*	*48*	*45*	*43*
035.	Oregon State University-Corvallis	12	28	14	.18	9.8	.74	.26
	Geography	*48*	*64*	*45*	*44*	*42*	*51*	*49*
036.	Oregon, University of-Eugene	9	19	9	.14	8.0	.57	.21
	Geography	*41*	*54*	*42*	*42*	*55*	*39*	*45*
037.	Pennsylvania State University	13	16	15	.53	7.8	.81	.31
	Geography	*50*	*50*	*45*	*69*	*56*	*57*	*53*
038.	Pittsburgh, University of	7	18	12	.23	9.5	.64	.21
	Geography	*37*	*53*	*44*	*48*	*44*	*44*	*45*
039.	Rutgers, The State University-New Brunswick	20	8	20	NA	NA	NA	NA
	Geography	*65*	*42*	*49*				
040.	SUNY at Buffalo	12	3	20	NA	NA	NA	NA
	*Geography**	*48*	*36*	*49*				

* indicates program was initiated since 1970.

NOTE: On the first line of data for every program, raw values for each measure are reported; on the second line values are reported in standardized form, with mean = 50 and standard deviation = 10. "NA" indicates that the value for a measure is not available.

TABLE 5.1 Program Measures (Raw and Standardized Values) in Geography

Prog No.	Survey Results (08)	(09)	(10)	(11)	University Library (12)	Research Support (13)	(14)	Published Articles (17)	(18)	Survey Ratings Standard Error (08)	(09)	(10)	(11)
021.	3.3	2.0	1.1	1.3	0.1	.06	NA	15	.56	.08	.06	.07	.06
	56	58	53	53	47	42		48	53				
022.	1.6	1.0	0.9	0.8	-1.8	.10	NA	9	.40	.10	.08	.06	.06
	37	37	46	38	27	46		43	43				
023.	2.1	1.2	1.3	1.1	-0.1	.00	NA	24	.73	.10	.08	.08	.07
	42	40	61	47	45	37		56	64				
024.	3.2	1.9	1.0	1.0	-0.3	.00	NA	14	.53	.10	.06	.05	.07
	55	57	50	45	42	37		47	51				
025.	2.3	1.4	1.1	1.1	0.2	.07	NA	6	.27	.09	.07	.06	.07
	45	45	53	47	49	43		40	35				
026.	2.8	1.7	0.9	1.2	0.3	.12	NA	20	.53	.09	.07	.07	.07
	51	52	47	51	50	48		53	51				
027.	2.9	1.7	0.1	1.6	1.8	.08	NA	14	.54	.12	.07	.04	.05
	52	51	22	63	65	44		47	52				
028.	4.6	2.6	1.3	1.8	1.2	.20	NA	43	.70	.07	.06	.06	.05
	71	70	59	69	59	55		74	62				
029.	2.7	1.7	1.4	1.1	-0.5	.24	NA	10	.35	.08	.06	.07	.07
	49	51	62	47	41	59		44	40				
030.	2.6	1.6	1.1	1.1	1.0	.00	NA	11	.73	.09	.07	.06	.06
	49	50	54	47	57	37		45	64				
031.	0.8	0.7	0.9	0.4	NA	NA	NA	8	NA	.10	.08	.06	.06
	28	30	47	25				42					
032.	2.6	1.2	0.2	1.5	0.3	NA	NA	6	NA	.13	.08	.05	.06
	48	41	25	59	49			40					
033.	3.9	2.4	0.8	1.6	0.9	.43	NA	37	.71	.09	.06	.07	.05
	63	66	43	63	56	76		68	63				
034.	2.3	1.4	1.0	1.1	-0.6	.17	NA	17	.25	.09	.07	.09	.06
	45	45	50	48	40	52		50	33				
035.	2.0	1.4	1.0	0.9	NA	.00	NA	5	.33	.10	.09	.06	.06
	42	45	51	40		37		39	39				
036.	2.3	1.4	0.8	1.0	-0.9	NA	NA	1	NA	.10	.08	.06	.07
	45	45	44	44	36			35					
037.	4.3	2.4	1.2	1.7	0.7	.23	NA	30	.54	.07	.06	.06	.05
	68	66	57	66	54	58		62	52				
038.	1.4	0.9	0.5	0.8	0.1	NA	NA	1	NA	.10	.08	.06	.06
	35	36	33	39	47			35					
039.	2.9	1.6	1.2	1.2	0.8	.05	NA	24	.55	.10	.06	.07	.06
	51	49	58	50	55	42		56	53				
040.	3.2	1.7	1.6	1.3	0.3	.08	NA	27	.67	.09	.07	.07	.06
	55	52	70	54	49	45		59	60				

NOTE: On the first line of data for every program, raw values for each measure are reported; on the second line values are reported in standardized form, with mean = 50 and standard deviation = 10. "NA" indicates that the value for a measure is not available.

TABLE 5.1 Program Measures (Raw and Standardized Values) in Geography

Prog No.	University - Department/Academic Unit	Program Size (01)	(02)	(03)	Characteristics of Program Graduates (04)	(05)	(06)	(07)
041.	Southern Illinois University-Carbondale	12	12	12	.08	9.2	.83	.42
	Geography	*48*	*46*	*44*	*38*	*47*	*58*	*61*
042.	Syracuse University	13	24	22	.32	8.3	.62	.23
	Geography	*50*	*59*	*50*	*54*	*53*	*42*	*46*
043.	Tennessee, University of-Knoxville	12	8	17	.54	9.3	.85	.15
	Geography	*48*	*42*	*47*	*70*	*45*	*59*	*40*
044.	Texas A & M University	8	2	17	NA	NA	NA	NA
	Geography	*39*	*35*	*47*				
045.	Texas, University of-Austin	12	7	10	.46	11.3	.73	.27
	Geography	*48*	*41*	*42*	*64*	*32*	*50*	*50*
046.	Utah, University of-Salt Lake City	10	5	5	NA	NA	NA	NA
	Geography	*43*	*38*	*39*				
047.	Washington, University of-Seattle	15	14	14	.21	9.8	.68	.26
	Geography	*54*	*48*	*45*	*47*	*42*	*47*	*49*
048.	Wisconsin, University of-Madison	19	30	55	.31	8.5	.83	.49
	Geography	*63*	*66*	*71*	*53*	*51*	*58*	*66*
049.	Wisconsin, University of-Milwaukee	14	11	11	.00	10.0	1.00	.30
	Geography	*52*	*45*	*43*	*32*	*41*	*70*	*52*

* indicates program was initiated since 1970.

NOTE: On the first line of data for every program, raw values for each measure are reported; on the second line values are reported in standardized form, with mean = 50 and standard deviation = 10. "NA" indicates that the value for a measure is not available.

TABLE 5.1 Program Measures (Raw and Standardized Values) in Geography

Prog	Survey Results				University Library	Research Support		Published Articles		Survey Ratings Standard Error			
No.	(08)	(09)	(10)	(11)	(12)	(13)	(14)	(17)	(18)	(08)	(09)	(10)	(11)
041.	1.9	1.1	0.6	0.9	-0.2	.17	NA	7	.33	.11	.09	.08	.07
	40	*38*	*38*	*40*	*44*	*52*		*41*	*39*				
042.	3.6	2.0	1.1	1.5	-0.3	.23	NA	29	.54	.08	.05	.06	.06
	59	*59*	*53*	*60*	*42*	*58*		*61*	*52*				
043.	2.2	1.4	1.3	1.0	-0.4	.17	NA	13	.50	.10	.07	.07	.06
	44	*45*	*58*	*45*	*42*	*52*		*46*	*49*				
044.	2.2	1.2	1.1	1.1	-0.5	NA	NA	6	NA	.11	.09	.08	.07
	44	*41*	*53*	*46*	*41*			*40*					
045.	2.5	1.4	0.7	1.2	1.6	.00	NA	13	.50	.09	.07	.06	.06
	48	*44*	*40*	*49*	*64*	*37*		*46*	*49*				
046.	1.7	1.0	1.0	0.7	-0.6	.00	NA	6	.50	.09	.08	.06	.06
	38	*37*	*49*	*34*	*39*	*37*		*40*	*49*				
047.	3.6	2.2	0.9	1.5	1.5	.20	NA	30	.67	.08	.06	.06	.06
	59	*62*	*48*	*60*	*62*	*55*		*62*	*60*				
048.	4.1	2.5	0.9	1.6	1.6	.11	NA	26	.74	.08	.05	.07	.05
	66	*68*	*47*	*65*	*63*	*47*		*58*	*65*				
049.	3.0	1.8	1.2	1.3	NA	.29	NA	18	.57	.08	.06	.05	.06
	53	*53*	*56*	*53*		*63*		*51*	*54*				

NOTE: On the first line of data for every program, raw values for each measure are reported; on the second line values are reported in standardized form, with mean = 50 and standard deviation = 10. "NA" indicates that the value for a measure is not available.

TABLE 5.2 Summary Statistics Describing Each Program Measure--Geography

Measure	Number of Programs Evaluated	Mean	Standard Deviation	DECILES								
				1	2	3	4	5	6	7	8	9
Program Size												
01 Raw Value	49	13	5	7	9	11	12	13	13	15	17	19
Std Value	49	50	10	37	41	46	48	50	50	54	58	63
02 Raw Value	49	16	9	5	7	9	12	13	17	20	23	29
Std Value	49	50	10	38	41	43	46	47	52	55	58	65
03 Raw Value	49	22	16	6	9	12	14	19	22	25	34	39
Std Value	49	50	10	40	42	44	45	48	50	52	57	61
Program Graduates												
04 Raw Value	36	.26	.14	.10	.14	.15	.18	.21	.26	.33	.41	.45
Std Value	36	50	10	39	41	42	44	46	50	55	61	64
05 Raw Value	36	8.7	1.4	11.0	9.8	9.2	9.0	8.5	8.2	8.0	7.5	7.0
Std Value	36	50	10	34	42	46	48	51	53	55	58	62
06 Raw Value	36	.72	.14	.54	.57	.64	.67	.74	.78	.83	.83	.85
Std Value	36	50	10	37	39	44	46	51	54	58	58	59
07 Raw Value	36	.28	.13	.09	.17	.21	.23	.26	.29	.32	.33	.45
Std Value	36	50	10	35	42	45	46	48	51	53	54	63
Survey Results												
08 Raw Value	49	2.8	.9	1.6	2.0	2.2	2.4	2.7	2.9	3.2	3.5	4.0
Std Value	49	50	10	37	41	44	46	49	52	55	59	64
09 Raw Value	49	1.6	.5	1.0	1.2	1.3	1.4	1.6	1.7	1.9	2.1	2.3
Std Value	49	50	10	37	41	43	45	50	52	56	60	64
10 Raw Value	49	1.0	.3	.6	.8	.9	.9	1.0	1.1	1.1	1.2	1.3
Std Value	49	50	10	37	44	47	47	50	54	54	57	60
11 Raw Value	49	1.2	.3	.8	.9	1.0	1.1	1.1	1.2	1.3	1.5	1.6
Std Value	49	50	10	38	41	45	48	48	51	54	61	64
University Library												
12 Raw Value	43	.4	.9	-.9	-.5	-.3	-.1	.3	.6	.9	1.1	1.7
Std Value	43	50	10	36	40	43	45	49	53	56	58	65
Research Support												
13 Raw Value	38	.14	.11	.00	.05	.07	.09	.12	.14	.17	.22	.29
Std Value	38	50	10	37	42	44	45	48	50	53	57	64
Publication Records												
17 Raw Value	49	17	11	4	6	9	13	15	18	23	27	30
Std Value	49	50	10	38	40	43	46	48	51	55	59	62
18 Raw Value	38	.51	.16	.26	.33	.43	.50	.53	.54	.57	.66	.72
Std Value	38	50	10	34	39	45	49	51	52	54	59	63

NOTE: Standardized values reported in the preceding table have been computed from exact values of the mean and standard deviation and not the rounded values reported here.

TABLE 5.3 Intercorrelations Among Program Measures on 49 Programs in Geography

	Measure															
	01	02	03	04	05	06	07	08	09	10	11	12	13	14	17	18
Program Size																
01		.48	.39	.15	-.17	.15	.25	.46	.51	.44	.35	.40	.00	N/A	.56	.06
02			.52	.09	.19	.13	.30	.60	.68	.00	.57	.30	.42	N/A	.46	.22
03				.07	.34	-.06	.11	.42	.43	.14	.41	.23	.30	N/A	.33	-.11
Program Graduates																
04					.05	-.02	.05	.36	.29	-.07	.43	.43	-.07	N/A	.23	.01
05						-.23	.23	.16	.18	-.07	.21	-.02	.43	N/A	.06	.02
06							.44	.36	.35	.39	.29	.12	.27	N/A	.37	.25
07								.51	.53	.10	.47	.29	.27	N/A	.45	.37
Survey Results																
08									.98	.19	.94	.52	.52	N/A	.78	.59
09										.22	.89	.50	.56	N/A	.77	.57
10											.04	-.05	.06	N/A	.45	.24
11												.59	.51	N/A	.73	.58
University Library																
12													.05	N/A	.48	.38
Research Support																
13														N/A	.42	.17
14															N/A	N/A
Publication Records																
17																.67
18																

NOTE: Since in computing correlation coefficients program data must be available for both of the measures being correlated, the actual number of programs on which each coefficient is based varies.

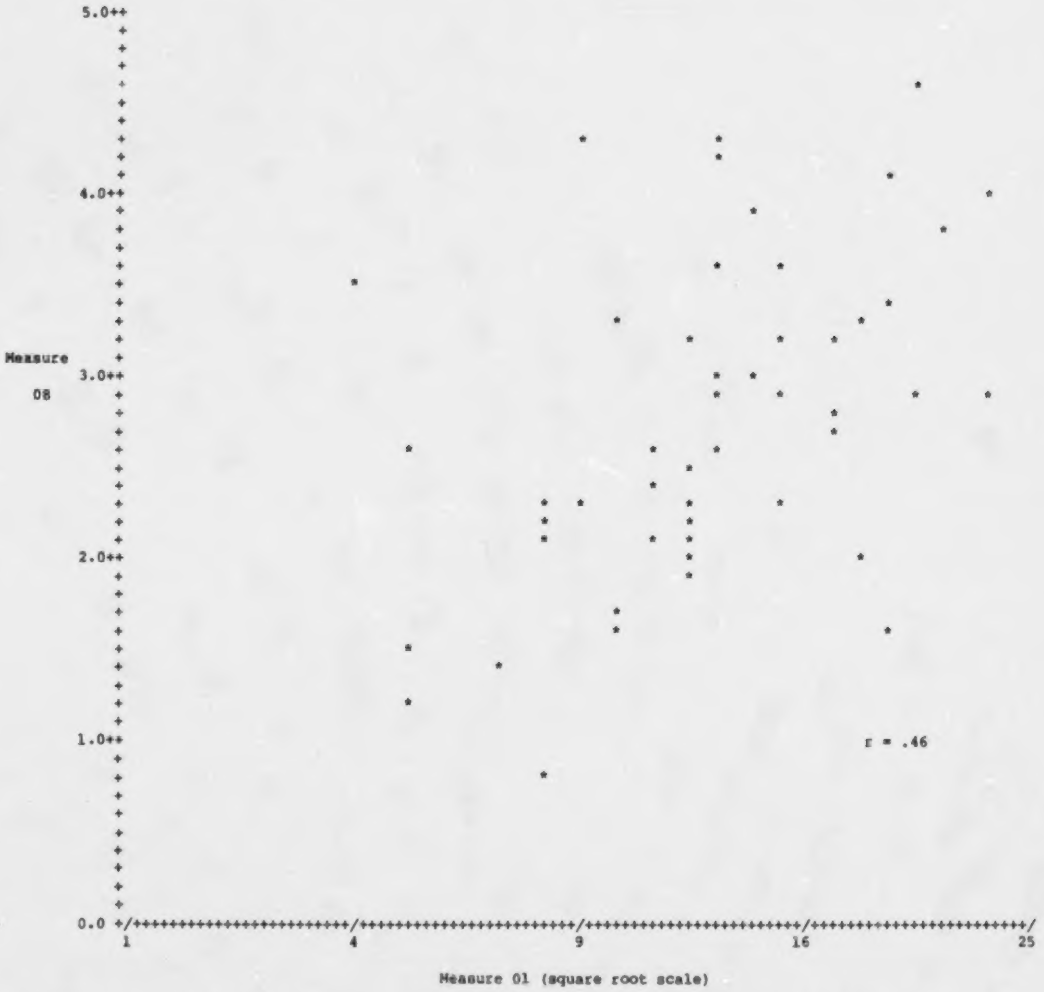

FIGURE 5.1 Mean rating of scholarly quality of faculty (measure 08) versus number of faculty members (measure 01)--49 programs in geography.

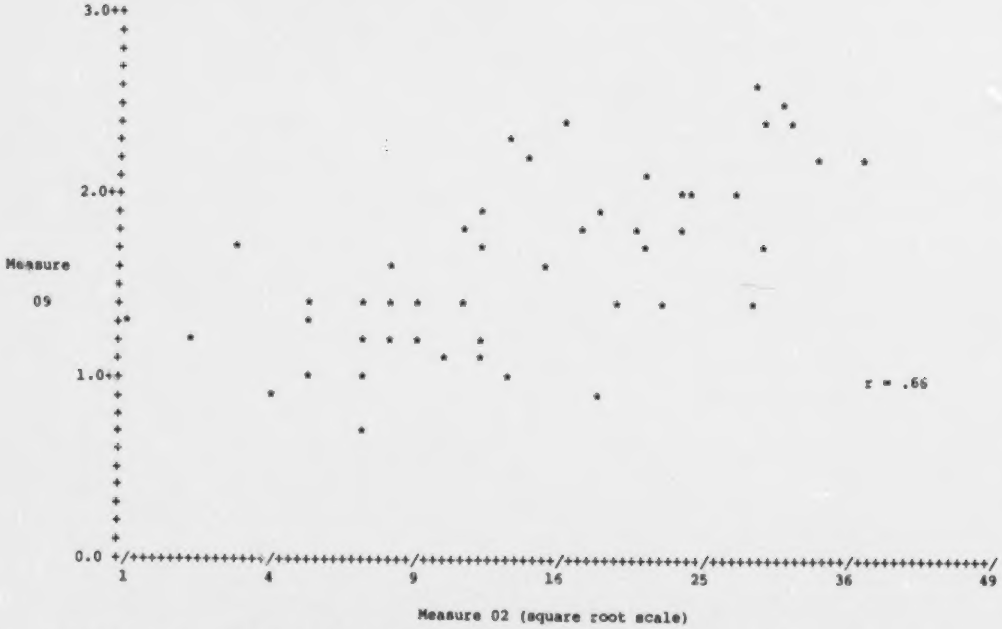

FIGURE 5.2 Mean rating of program effectiveness in educating research scholars/scientists (measure 09) versus number of graduates in last five years (measure 02)--49 programs in geography.

TABLE 5.4 Characteristics of Survey Participants in Geography

	Respondents	
	N	%
Field of Specialization		
Geography	104	98
Other/Unknown	2	2
Faculty Rank		
Professor	55	52
Associate Professor	32	30
Assistant Professor	19	18
Year of Highest Degree		
Pre-1950	2	2
1950-59	24	23
1960-69	41	39
Post-1969	39	37
Evaluator Selection		
Nominated by Institution	103	97
Other	3	3
Survey Form		
With Faculty Names	92	87
Without Names	14	13
Total Evaluators	106	100

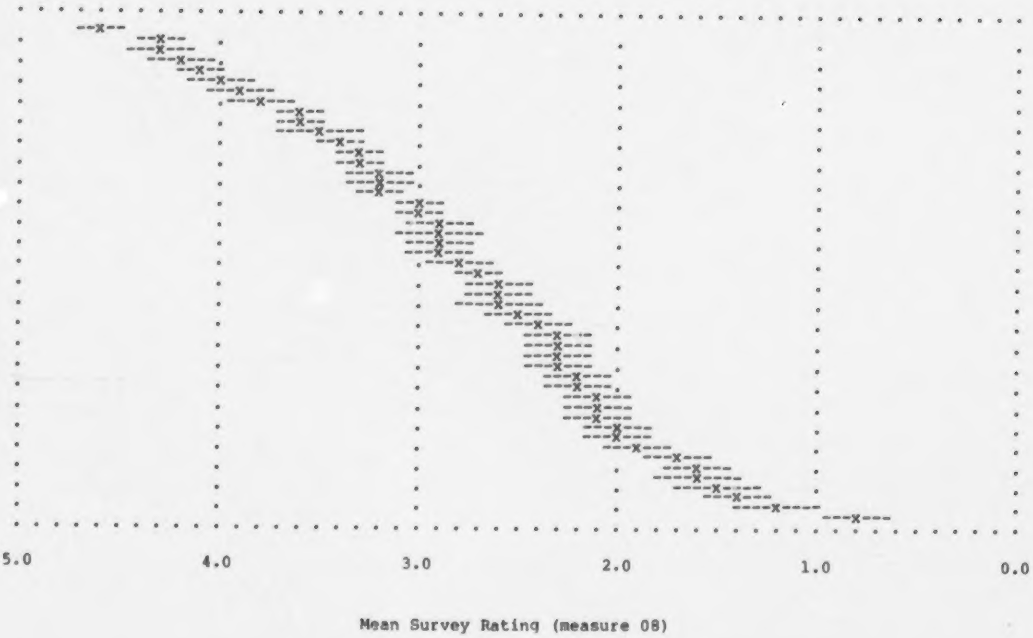

FIGURE 5.3 Mean rating of scholarly quality of faculty in 49 programs in geography.

NOTE: Programs are listed in sequence of mean rating, with the highest-rated program appearing at the top of the page. The broken lines (---) indicate a confidence interval of ±1.5 standard errors around the reported mean (x) of each program.

VI

History Programs

In this chapter 102 research-doctorate programs in history are assessed. These programs, according to the information supplied by their universities, have accounted for 3,877 doctoral degrees awarded during the FY1976-80 period--approximately 89 percent of the aggregate number of history doctorates earned from U.S. universities in this five-year span.[1] On the average, 51 full-time and part-time students intending to earn doctorates were enrolled in a program in December 1980, with an average faculty size of 28 members.[2] Two programs were initiated since 1970, and no two programs are located in the same university. In addition to the 102 institutions represented in this discipline, another 6 were initially identified as meeting the criteria[3] for inclusion in the assessment:

University of New Mexico--Albuquerque
University of North Dakota--Grand Forks
Yeshiva University
Graduate Theological Union--California
Illinois State University--Normal
Saint John's University

The last three institutions chose not to participate in the assessment in any discipline. History programs at the other three institutions have not been included in the evaluations in this discipline, since in each case the study coordinator either indicated that the institution did not at that time have a research-doctorate program in history or failed to provide the information requested by the committee.

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[1] Data from the NRC's Survey of Earned Doctorates indicate that 4,341 research doctorates in history were awarded by U.S. universities between FY1976 and FY1980.

[2] See the reported means for measures 03 and 01 in Table 6.2.

[3] As mentioned in Chapter I, the primary criterion for inclusion was that a university had awarded at least 11 doctorates in history during the FY1976-78 period.

Before examining individual program results presented in Table 6.1, the reader is urged to refer to Chapter II, in which each of the 16 measures used in the assessment is discussed. Summary statistics describing every measure are given in Table 6.2. For 13 of the measures, data are reported for at least 98 of the 102 history programs. For measure 12, a composite index of the size of a university library, data are available for 75 programs. The programs not evaluated on this measure are typically smaller--in terms of faculty size and graduate student enrollment--than other history programs. Were data on measure 12 available for all 102 programs, it is likely that their reported mean would be appreciably lower (and that some of the correlations of this measure with others would be higher). As mentioned in Chapter II, data on the fraction of program faculty with research grants from the Alcohol, Drug Abuse, and Mental Health Administration, the National Institutes of Health, or the National Science Foundation (measure 13) and data on the total university expenditures for research (measure 14) are not presented for programs in history.

Intercorrelations among the 14 measures (Pearson product-moment coefficients) are given in Table 6.3. Of particular note are the high positive correlations of the measures of program size (01, 02, and 03) with the total published articles by program faculty (17) and the reputational survey ratings (08, 09). Also of interest are the high positive correlations of university library size (12) with reputational survey ratings (08 and 09). Figure 6.1 illustrates the relation between the mean rating of the scholarly quality of faculty (measure 08) and the number of faculty members (measure 01) for each of 102 programs in history. Figure 6.2 plots the mean rating of program effectiveness (measure 09) against the total number of FY1976-80 program graduates (measure 02). Although in both figures there is a significant positive correlation between program size and reputational rating, it is quite apparent that some of the smaller programs received high mean ratings and that some of the larger programs received low mean ratings.

Table 6.4 describes the 166 faculty members who participated in the evaluation of history programs. These individuals constituted 54 percent of those asked to respond to the survey in this discipline and 6 percent of the faculty population in the 102 research-doctorate programs being evaluated.* More than two-thirds of the survey participants had earned their highest degree prior to 1970, and a majority held the rank of full professor.

To assist the reader in interpreting results of the survey evaluations, estimated standard errors have been computed for mean ratings of the scholarly quality of faculty in 102 history programs (and are given in Table 6.1). For each program the mean rating and an associated "confidence interval" of 1.5 standard errors are illustrated in Figure 6.3 (listed in order of highest to lowest mean rating). In comparing two programs, if their confidence intervals do not overlap, one may conclude that there is a significant difference in their mean ratings at a .05 level of significance.[5] From this figure it is also apparent that one should have somewhat more confidence in the accuracy of the mean ratings of higher-rated programs than lower-rated programs. This generalization results primarily from the fact that evaluators are not as likely to be familiar with the less prestigious programs, and consequently the mean ratings of these programs are usually based on fewer survey responses.

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*See Table 2.3 in Chapter II.

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[5] See pp. 30-32 for a discussion of the interpretation of mean ratings and associated confidence intervals.

TABLE 6.1 Program Measures (Raw and Standardized Values) in History

Prog No.	University - Department/Academic Unit	Program Size			Characteristics of Program Graduates			
		(01)	(02)	(03)	(04)	(05)	(06)	(07)
001.	American University	12	19	28	.05	12.3	.70	.05
	History	*38*	*44*	*45*	*35*	*29*	*62*	*38*
002.	Arizona, University of-Tucson	24	10	28	.29	8.8	.39	.08
	History	*47*	*41*	*45*	*51*	*53*	*34*	*41*
003.	Arkansas, University-Fayetteville	20	7	20	NA	NA	NA	NA
	*History**	*44*	*40*	*44*				
004.	Auburn University	18	10	21	.20	9.5	.60	.20
	History	*42*	*41*	*44*	*46*	*48*	*54*	*55*
005.	Boston College	28	14	29	.39	7.4	.42	.17
	History	*50*	*43*	*45*	*58*	*63*	*37*	*51*
006.	Boston University	28	30	46	.19	9.4	.48	.13
	History	*50*	*48*	*49*	*45*	*49*	*43*	*47*
007.	Brandeis University	16	19	41	.43	7.5	.57	.14
	History of Am Civilization/Comparative Hist	*41*	*44*	*48*	*61*	*62*	*51*	*48*
008.	Brown University	28	29	54	.54	7.3	.56	.28
	History	*50*	*47*	*51*	*68*	*63*	*50*	*64*
009.	Bryn Mawr College	13	7	15	.50	5.2	.30	.10
	History	*38*	*40*	*43*	*66*	*78*	*27*	*43*
010.	CUNY-Graduate School	40	43	97	.29	11.2	.37	.09
	History	*60*	*52*	*60*	*52*	*36*	*33*	*43*
011.	California, University of-Berkeley	53	123	134	.46	10.2	.59	.34
	History	*70*	*76*	*67*	*63*	*43*	*53*	*70*
012.	California, University of-Davis	27	20	22	.24	8.0	.45	.10
	History	*49*	*44*	*44*	*48*	*58*	*40*	*43*
013.	California, University of-Irvine	18	14	40	.33	8.0	.42	.25
	History	*42*	*43*	*48*	*55*	*58*	*37*	*60*
014.	California, University of-Los Angeles	65	141	209	.30	9.2	.51	.25
	History	*80*	*82*	*83*	*52*	*50*	*45*	*60*
015.	California, University of-Riverside	14	9	18	NA	NA	NA	NA
	History	*39*	*41*	*43*				
016.	California, University of-San Diego	24	15	39	.16	7.5	.50	.20
	History	*47*	*43*	*48*	*43*	*62*	*45*	*55*
017.	California, University of-Santa Barbara	38	77	60	.21	8.8	.47	.12
	History	*58*	*62*	*52*	*47*	*53*	*42*	*45*
018.	Carnegie-Mellon University	11	33	59	.26	9.3	.60	.20
	History and Philosophy	*37*	*48*	*52*	*50*	*50*	*54*	*55*
019.	Case Western Reserve University	9	21	9	.17	10.0	.60	.13
	History	*35*	*45*	*41*	*44*	*44*	*54*	*47*
020.	Catholic University of America	16	26	26	.09	11.8	.61	.03
	History	*41*	*46*	*45*	*38*	*32*	*54*	*35*

* indicates program was initiated since 1970.

NOTE: On the first line of data for every program, raw values for each measure are reported; on the second line values are reported in standardized form, with mean = 50 and standard deviation = 10. "NA" indicates that the value for a measure is not available.

TABLE 6.1 Program Measures (Raw and Standardized Values) in History

Prog No.	Survey Results				University Library	Research Support		Published Articles		Survey Ratings Standard Error			
	(08)	(09)	(10)	(11)	(12)	(13)	(14)	(17)	(18)	(08)	(09)	(10)	(11)
001.	1.6	1.0	0.9	0.6	NA	NA	NA	11	.42	.14	.11	.09	.06
	40	39	43	42				40	39				
002.	2.5	1.5	1.7	0.9	0.9	NA	NA	34	.50	.11	.12	.09	.07
	49	50	81	49	57			47	45				
003.	1.4	0.9	1.1	0.5	NA	NA	NA	12	.30	.13	.10	.14	.07
	38	38	52	40				40	31				
004.	1.1	0.6	1.1	0.3	NA	NA	NA	16	.56	.13	.14	.07	.05
	36	33	51	35				41	49				
005.	1.4	1.0	1.0	0.5	NA	NA	NA	38	.61	.14	.11	.13	.06
	38	39	46	39				49	52				
006.	2.8	1.5	1.1	0.9	-0.4	NA	NA	70	.79	.10	.09	.09	.07
	52	50	53	49	45			59	65				
007.	3.7	2.1	1.1	1.3	NA	NA	NA	27	.63	.11	.07	.08	.07
	61	60	54	60				45	53				
008.	3.9	2.2	1.4	1.3	-1.1	NA	NA	65	.82	.10	.08	.09	.08
	62	63	66	58	38			57	67				
009.	2.5	1.6	1.0	0.7	NA	NA	NA	11	.46	.16	.12	.10	.08
	49	52	50	44				40	42				
010.	4.0	2.0	1.2	1.3	NA	NA	NA	54	.50	.10	.08	.12	.08
	63	58	55	60				54	45				
011.	4.8	2.6	1.0	1.8	2.2	NA	NA	112	.70	.05	.08	.06	.05
	71	69	49	70	70			73	59				
012.	2.9	1.8	1.3	1.0	0.6	NA	NA	36	.63	.09	.08	.07	.07
	53	54	61	53	55			48	54				
013.	2.0	1.1	1.1	0.8	NA	NA	NA	1	.06	.15	.12	.13	.08
	44	42	52	47				36	14				
014.	4.1	2.2	1.1	1.6	2.0	NA	NA	113	.59	.07	.06	.08	.06
	64	62	53	65	68			73	51				
015.	1.6	1.0	0.7	0.7	-1.0	NA	NA	16	.57	.13	.11	.10	.07
	41	39	31	45	39			41	50				
016.	3.3	1.9	1.6	1.2	-0.0	NA	NA	24	.50	.11	.07	.09	.07
	56	56	78	55	48			44	45				
017.	3.3	1.9	1.3	1.2	-0.1	NA	NA	66	.58	.10	.08	.09	.07
	57	58	61	57	47			58	50				
018.	2.2	1.4	1.0	0.7	NA	NA	NA	18	.46	.16	.13	.11	.07
	46	48	48	45				42	42				
019.	1.8	1.3	0.7	0.8	-1.3	NA	NA	7	NA	.16	.13	.13	.07
	42	45	35	46	36			38					
020.	1.9	1.2	0.8	0.5	NA	NA	NA	27	.81	.14	.13	.15	.08
	43	43	37	39				45	67				

NOTE: On the first line of data for every program, raw values for each measure are reported; on the second line values are reported in standardized form, with mean = 50 and standard deviation = 10. "NA" indicates that the value for a measure is not available.

TABLE 6.1 Program Measures (Raw and Standardized Values) in History

Prog No.	University - Department/Academic Unit	Program Size			Characteristics of Program Graduates			
		(01)	(02)	(03)	(04)	(05)	(06)	(07)
021.	Chicago, University of	46	127	125	.40	9.6	.59	.23
	History	*65*	*77*	*65*	*59*	*47*	*53*	*58*
022.	Cincinnati, University of	28	21	42	.28	9.0	.83	.11
	History	*50*	*45*	*48*	*51*	*51*	*74*	*45*
023.	Claremont Graduate School	19	16	57	.35	10.5	.47	.05
	History	*43*	*43*	*51*	*56*	*41*	*42*	*38*
024.	Colorado, University of	26	19	35	.10	12.0	.50	.05
	History	*49*	*44*	*47*	*39*	*30*	*45*	*38*
025.	Columbia University	52	143	305	.46	9.3	.59	.25
	History	*69*	*82*	*99*	*63*	*50*	*53*	*60*
026.	Connecticut, University of-Storrs	32	20	28	.18	11.5	.46	.14
	History	*53*	*44*	*45*	*44*	*34*	*41*	*47*
027.	Cornell University-Ithaca	27	37	43	.55	7.7	.64	.32
	History	*49*	*50*	*48*	*69*	*61*	*57*	*68*
028.	Delaware, University of-Newark	35	25	32	.29	9.8	.66	.14
	History	*56*	*46*	*46*	*52*	*46*	*58*	*48*
029.	Denver, University of	15	11	10	.07	13.5	.50	.00
	History	*40*	*42*	*41*	*37*	*20*	*45*	*32*
030.	Duke University	35	69	83	.29	6.5	.60	.13
	History	*56*	*60*	*57*	*52*	*69*	*54*	*47*
031.	Emory University	20	25	28	.44	10.0	.46	.04
	History	*44*	*46*	*45*	*62*	*44*	*41*	*36*
032.	Florida State University-Tallahassee	24	34	26	.18	9.5	.57	.07
	History	*47*	*49*	*45*	*44*	*48*	*51*	*40*
033.	Florida, University of-Gainesville	30	23	37	.48	8.9	.41	.09
	History	*52*	*45*	*47*	*64*	*52*	*36*	*42*
034.	Fordham University	17	9	31	.10	12.5	.60	.10
	History	*42*	*41*	*46*	*39*	*27*	*54*	*43*
035.	George Washington University	18	17	34	.08	12.8	.69	.15
	History	*42*	*44*	*46*	*37*	*25*	*62*	*49*
036.	Georgetown University	16	34	43	.33	9.8	.53	.03
	History	*41*	*49*	*48*	*55*	*46*	*47*	*35*
037.	Georgia, University of-Athens	26	24	11	.17	9.0	.71	.17
	History	*49*	*46*	*42*	*43*	*51*	*63*	*51*
038.	Harvard University	29	128	123	.35	8.3	.78	.39
	History	*51*	*78*	*65*	*56*	*56*	*69*	*76*
039.	Hawaii, University of	36	28	39	.39	10.2	.70	.17
	History	*57*	*47*	*48*	*58*	*43*	*62*	*52*
040.	Howard University	17	16	33	.24	8.7	.41	.06
	History	*42*	*43*	*46*	*48*	*54*	*37*	*39*

* indicates program was initiated since 1970.

NOTE: On the first line of data for every program, raw values for each measure are reported; on the second line values are reported in standardized form, with mean = 50 and standard deviation = 10. "NA" indicates that the value for a measure is not available.

TABLE 6.1 Program Measures (Raw and Standardized Values) in History

Prog No.	Survey Results				University Library	Research Support		Published Articles		Survey Ratings Standard Error			
	(08)	(09)	(10)	(11)	(12)	(13)	(14)	(17)	(18)	(08)	(09)	(10)	(11)
021.	4.5	2.3	1.1	1.6	0.9	NA	NA	149	.91	.08	.08	.09	.06
	68	*65*	*53*	*67*	*57*			*85*	*74*				
022.	2.3	1.4	1.1	0.9	-0.2	NA	NA	43	.61	.10	.10	.10	.06
	47	*47*	*51*	*49*	*46*			*50*	*52*				
023.	2.5	1.4	1.2	0.7	NA	NA	NA	11	.47	.12	.11	.12	.08
	49	*47*	*55*	*45*				*40*	*43*				
024.	2.1	1.2	0.9	0.6	-0.9	NA	NA	34	.50	.13	.12	.11	.07
	45	*44*	*42*	*43*	*40*			*47*	*45*				
025.	4.5	2.4	0.8	1.6	1.7	NA	NA	97	.62	.08	.07	.07	.06
	68	*66*	*37*	*67*	*65*			*68*	*53*				
026.	2.6	1.6	1.2	0.7	-0.5	NA	NA	33	.41	.11	.09	.10	.07
	50	*50*	*57*	*44*	*44*			*47*	*38*				
027.	3.9	2.2	0.9	1.5	1.6	NA	NA	52	.78	.09	.07	.07	.07
	62	*63*	*41*	*64*	*64*			*53*	*64*				
028.	2.7	1.6	1.5	0.9	NA	NA	NA	69	.77	.11	.10	.10	.08
	50	*51*	*72*	*49*				*59*	*64*				
029.	1.0	0.7	1.1	0.4	NA	NA	NA	10	.53	.13	.10	.10	.06
	35	*34*	*51*	*38*				*39*	*47*				
030.	3.7	2.1	1.3	1.4	0.3	NA	NA	82	.66	.09	.07	.12	.08
	60	*60*	*60*	*62*	*52*			*63*	*56*				
031.	2.8	1.8	1.2	1.0	-0.6	NA	NA	40	.55	.13	.10	.10	.07
	52	*55*	*55*	*51*	*42*			*49*	*48*				
032.	1.9	1.2	1.1	0.5	-0.4	NA	NA	23	.38	.14	.10	.05	.06
	43	*44*	*52*	*41*	*44*			*44*	*36*				
033.	2.1	1.3	1.1	0.7	0.8	NA	NA	26	.53	.15	.11	.12	.06
	45	*44*	*54*	*45*	*56*			*45*	*47*				
034.	1.5	0.9	0.9	0.4	NA	NA	NA	21	.59	.15	.11	.15	.06
	39	*38*	*42*	*37*				*43*	*51*				
035.	1.8	1.2	0.9	0.6	NA	NA	NA	21	.50	.13	.09	.11	.07
	42	*43*	*43*	*42*				*43*	*45*				
036.	1.4	1.2	0.9	0.6	-0.6	NA	NA	8	.44	.13	.12	.12	.08
	38	*44*	*41*	*41*	*42*			*39*	*40*				
037.	2.6	1.5	1.1	0.9	0.4	NA	NA	54	.73	.09	.09	.08	.08
	50	*48*	*53*	*49*	*53*			*54*	*61*				
038.	4.8	2.4	0.7	1.9	3.0	NA	NA	61	.69	.05	.07	.08	.04
	70	*67*	*34*	*73*	*78*			*56*	*58*				
039.	2.1	1.2	1.4	0.4	-0.1	NA	NA	33	.50	.17	.14	.15	.07
	45	*43*	*66*	*37*	*47*			*47*	*45*				
040.	1.1	0.8	1.0	0.4	-0.4	NA	NA	14	.41	.13	.14	.12	.06
	36	*35*	*45*	*36*	*45*			*41*	*39*				

NOTE: On the first line of data for every program, raw values for each measure are reported; on the second line values are reported in standardized form, with mean = 50 and standard deviation = 10. "NA" indicates that the value for a measure is not available.

TABLE 6.1 Program Measures (Raw and Standardized Values) in History

Prog No.	University - Department/Academic Unit	Program Size (01)	Program Size (02)	Program Size (03)	Characteristics of Program Graduates (04)	Characteristics of Program Graduates (05)	Characteristics of Program Graduates (06)	Characteristics of Program Graduates (07)
041.	Illinois, University of-Chicago Circle	35	23	49	.33	11.3	.50	.15
	History	*56*	*45*	*50*	*55*	*36*	*45*	*49*
042.	Illinois, University-Urbana/Champaign	34	45	54	.23	9.2	.65	.16
	History	*55*	*52*	*51*	*48*	*50*	*58*	*50*
043.	Indiana University-Bloomington	53	95	135	.37	9.4	.66	.17
	History	*70*	*67*	*68*	*57*	*49*	*59*	*51*
044.	Iowa, University of-Iowa City	27	41	61	.28	11.4	.49	.16
	History	*49*	*51*	*52*	*51*	*35*	*43*	*50*
045.	Johns Hopkins University	18	45	61	.38	6.7	.57	.31
	History	*42*	*52*	*52*	*58*	*67*	*51*	*68*
046.	Kansas, University of	40	32	66	.47	9.5	.56	.14
	History	*60*	*48*	*53*	*64*	*48*	*50*	*48*
047.	Kent State University	25	34	38	.14	8.0	.75	.19
	History	*48*	*49*	*47*	*42*	*58*	*67*	*53*
048.	Kentucky, University of	22	32	34	.24	10.5	.68	.08
	History	*46*	*48*	*46*	*49*	*41*	*60*	*41*
049.	Louisiana State University-Baton Rouge	22	24	27	.14	10.0	.52	.15
	History	*46*	*46*	*45*	*42*	*44*	*46*	*49*
050.	Loyola University of Chicago	25	16	23	.06	9.8	.59	.06
	History	*48*	*43*	*44*	*36*	*46*	*52*	*39*
051.	Maine, University of-Orono	15	20	11	.07	8.4	.67	.07
	History	*40*	*44*	*42*	*37*	*56*	*60*	*40*
052.	Maryland, University of-College Park	53	55	127	.17	9.4	.37	.20
	History	*70*	*55*	*66*	*44*	*49*	*33*	*54*
053.	Massachusetts, University of-Amherst	16	26	21	.04	10.2	.41	.14
	History	*41*	*46*	*44*	*35*	*43*	*36*	*47*
054.	Miami University-Ohio	21	29	11	.04	7.4	.54	.08
	History	*45*	*47*	*42*	*35*	*63*	*48*	*41*
055.	Michigan State University-East Lansing	32	33	33	.30	9.9	.50	.16
	History	*53*	*48*	*46*	*52*	*45*	*45*	*50*
056.	Michigan, University of-Ann Arbor	61	128	101	.41	8.5	.54	.20
	History	*77*	*78*	*60*	*60*	*55*	*48*	*55*
057.	Minnesota, University of	40	67	51	.15	11.2	.50	.23
	History	*60*	*59*	*50*	*42*	*36*	*45*	*58*
058.	Mississippi State University-Starkville	12	14	10	.05	8.1	.74	.21
	History	*38*	*43*	*41*	*36*	*58*	*66*	*56*
059.	Missouri, University of-Columbia	24	30	34	.20	9.3	.63	.08
	History	*47*	*48*	*46*	*46*	*49*	*56*	*41*
060.	Nebraska, University of-Lincoln	22	24	12	.10	8.3	.63	.32
	History	*46*	*46*	*42*	*39*	*57*	*56*	*68*

* indicates program was initiated since 1970.

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TABLE 6.1 Program Measures (Raw and Standardized Values) in History

Prog No.	Survey Results				University Library	Research Support		Published Articles		Survey Ratings Standard Error			
	(08)	(09)	(10)	(11)	(12)	(13)	(14)	(17)	(18)	(08)	(09)	(10)	(11)
041.	2.9	1.6	1.2	1.1	NA	NA	NA	54	.60	.10	.09	.09	.07
	53	*52*	*57*	*55*				*54*	*52*				
042.	3.3	2.0	1.0	1.3	2.0	NA	NA	72	.71	.10	.08	.08	.06
	56	*58*	*47*	*58*	*68*			*60*	*59*				
043.	3.9	2.2	1.4	1.6	0.9	NA	NA	103	.76	.08	.06	.07	.06
	63	*63*	*67*	*65*	*58*			*70*	*63*				
044.	3.4	2.0	1.1	1.3	0.3	NA	NA	41	.82	.08	.07	.07	.07
	58	*58*	*51*	*59*	*51*			*50*	*67*				
045.	4.3	2.4	1.1	1.6	-0.4	NA	NA	66	.83	.11	.07	.07	.06
	66	*67*	*53*	*65*	*45*			*58*	*68*				
046.	2.9	1.7	1.2	0.9	0.1	NA	NA	48	.63	.11	.08	.10	.08
	52	*52*	*55*	*49*	*49*			*52*	*53*				
047.	2.3	1.2	1.1	0.8	-1.8	NA	NA	33	.60	.13	.11	.09	.08
	47	*44*	*52*	*46*	*31*			*47*	*52*				
048.	2.4	1.5	1.1	0.8	-0.1	NA	NA	57	.77	.13	.08	.10	.07
	48	*49*	*52*	*46*	*48*			*55*	*64*				
049.	2.2	1.5	0.7	0.7	-0.3	NA	NA	15	.46	.13	.11	.12	.07
	46	*50*	*32*	*45*	*45*			*41*	*42*				
050.	1.3	0.9	1.1	0.5	NA	NA	NA	21	.52	.15	.12	.06	.07
	38	*37*	*51*	*38*				*43*	*46*				
051.	1.2	1.0	1.0	0.6	NA	NA	NA	21	.60	.14	.09	.07	.08
	37	*39*	*46*	*41*				*43*	*52*				
052.	3.1	1.7	1.2	1.2	0.2	NA	NA	76	.57	.12	.09	.10	.08
	54	*53*	*59*	*56*	*50*			*61*	*49*				
053.	2.3	1.4	0.9	0.8	-0.7	NA	NA	14	.50	.13	.12	.13	.07
	47	*48*	*45*	*46*	*41*			*41*	*45*				
054.	1.1	1.1	NA	0.4	-0.8	NA	NA	28	.52	.13	.16	NA	.07
	35	*40*		*38*	*41*			*45*	*46*				
055.	2.5	1.6	0.8	1.0	0.3	NA	NA	44	.63	.11	.09	.09	.06
	49	*51*	*38*	*52*	*52*			*50*	*53*				
056.	4.5	2.4	1.1	1.6	1.8	NA	NA	127	.71	.08	.06	.08	.07
	68	*67*	*53*	*65*	*66*			*78*	*59*				
057.	3.4	2.0	1.1	1.3	1.2	NA	NA	84	.70	.10	.07	.09	.07
	57	*59*	*53*	*58*	*60*			*64*	*59*				
058.	0.8	0.7	1.2	0.4	NA	NA	NA	9	.42	.14	.13	.11	.07
	33	*34*	*57*	*38*				*39*	*39*				
059.	2.9	1.8	1.0	1.0	-0.2	NA	NA	44	.58	.10	.08	.09	.08
	53	*54*	*49*	*52*	*47*			*50*	*51*				
060.	2.3	1.5	0.9	0.9	-0.5	NA	NA	38	.73	.09	.09	.09	.08
	47	*49*	*41*	*49*	*44*			*49*	*61*				

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TABLE 6.1 Program Measures (Raw and Standardized Values) in History

Prog No.	University - Department/Academic Unit	Program Size (01)	(02)	(03)	Characteristics of Program Graduates (04)	(05)	(06)	(07)
061.	New Hampshire, University of	17	7	11	NA	NA	NA	NA
	History	*42*	*40*	*42*				
062.	New York University	32	92	60	.16	11.5	.59	.10
	History	*53*	*67*	*52*	*43*	*34*	*52*	*43*
063.	North Carolina, University of-Chapel Hill	45	79	100	.19	8.4	.62	.21
	History	*64*	*63*	*60*	*45*	*55*	*55*	*55*
064.	North Texas State University-Denton	18	25	13	.00	8.3	.22	.00
	History	*42*	*46*	*42*	*32*	*56*	*19*	*32*
065.	Northwestern University	30	45	50	.46	8.8	.58	.26
	History	*52*	*52*	*50*	*63*	*53*	*52*	*61*
066.	Notre Dame, University of	14	27	36	.29	8.0	.58	.26
	History	*39*	*47*	*47*	*52*	*58*	*52*	*61*
067.	Ohio State University-Columbus	41	62	47	.13	9.5	.47	.10
	History	*61*	*57*	*49*	*41*	*48*	*41*	*43*
068.	Oklahoma State University-Stillwater	18	21	23	.00	7.5	.63	.19
	*History**	*42*	*45*	*44*	*32*	*62*	*56*	*53*
069.	Oklahoma, University of-Norman	22	21	27	.25	9.7	.62	.14
	History	*46*	*45*	*45*	*49*	*47*	*55*	*48*
070.	Oregon, University of-Eugene	24	10	15	.36	9.0	.40	.00
	History	*47*	*41*	*43*	*57*	*51*	*36*	*32*
071.	Pennsylvania State University	12	17	12	.33	8.3	.56	.17
	History	*38*	*44*	*42*	*55*	*56*	*50*	*51*
072.	Pennsylvania, University of	49	47	89	.36	8.4	.63	.16
	History	*67*	*53*	*58*	*56*	*56*	*56*	*50*
073.	Pittsburgh, University of	25	30	25	.26	8.8	.60	.27
	History	*48*	*48*	*45*	*50*	*53*	*54*	*62*
074.	Princeton University	36	64	48	.57	8.6	.75	.33
	History	*57*	*58*	*49*	*71*	*54*	*67*	*70*
075.	Rice University	12	13	18	.47	8.0	.59	.35
	History	*38*	*42*	*43*	*64*	*58*	*52*	*72*
076.	Rochester, University of	15	30	57	.40	8.5	.43	.11
	History	*40*	*48*	*51*	*59*	*55*	*38*	*45*
077.	Rutgers, The State University-New Brunswick	60	57	153	.19	8.5	.60	.22
	History	*76*	*56*	*71*	*45*	*55*	*54*	*57*
078.	SUNY at Binghamton	20	34	76	.10	7.8	.38	.07
	History	*44*	*49*	*55*	*39*	*60*	*34*	*40*
079.	SUNY at Buffalo	27	42	73	.31	9.4	.53	.21
	History	*49*	*51*	*55*	*53*	*49*	*47*	*55*
080.	SUNY at Stony Brook	29	26	41	.17	8.7	.48	.04
	History	*51*	*46*	*48*	*44*	*54*	*43*	*37*

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TABLE 6.1 Program Measures (Raw and Standardized Values) in History

Prog No.	Survey Results				University Library	Research Support		Published Articles		Survey Ratings Standard Error			
	(08)	(09)	(10)	(11)	(12)	(13)	(14)	(17)	(18)	(08)	(09)	(10)	(11)
061.	1.9	1.0	1.2	0.6	NA	NA	NA	27	.59	.12	.10	.10	.06
	43	39	57	42				45	51				
062.	3.1	1.8	1.3	1.2	0.5	NA	NA	39	.53	.09	.07	.08	.07
	54	56	61	55	53			49	47				
063.	3.8	2.2	1.1	1.4	1.0	NA	NA	68	.58	.08	.07	.08	.07
	62	63	52	62	58			58	50				
064.	1.3	0.8	1.3	0.4	NA	NA	NA	15	.44	.15	.12	.12	.06
	37	36	60	38				41	41				
065.	3.8	2.1	1.1	1.3	0.3	NA	NA	39	.63	.08	.08	.10	.07
	61	61	54	60	51			49	54				
066.	1.8	1.2	0.8	0.8	-1.3	NA	NA	19	.64	.11	.10	.10	.08
	43	44	38	47	35			42	55				
067.	2.9	1.7	1.0	1.1	0.9	NA	NA	74	.68	.09	.07	.08	.07
	52	54	46	53	57			60	58				
068.	1.1	0.6	0.7	0.4	-1.9	NA	NA	10	.33	.14	.11	.11	.06
	36	33	34	38	29			39	33				
069.	2.4	1.4	1.2	0.8	-0.6	NA	NA	12	.32	.12	.10	.11	.08
	48	48	55	48	43			40	32				
070.	2.1	1.4	0.7	0.7	-0.9	NA	NA	28	.63	.14	.11	.11	.07
	45	48	34	45	39			45	53				
071.	1.8	1.0	0.6	0.7	0.7	NA	NA	23	.83	.13	.11	.09	.07
	42	40	26	43	55			44	68				
072.	4.0	2.2	1.2	1.5	0.7	NA	NA	104	.74	.08	.06	.08	.06
	63	62	55	63	55			70	61				
073.	2.8	1.8	0.8	1.0	0.1	NA	NA	29	.60	.11	.09	.09	.07
	52	54	37	51	49			46	52				
074.	4.7	2.5	1.1	1.8	0.9	NA	NA	54	.56	.07	.07	.08	.05
	70	68	53	70	57			54	49				
075.	2.9	1.8	1.0	0.9	-1.4	NA	NA	27	.58	.12	.09	.10	.07
	52	54	48	50	34			45	51				
076.	3.7	2.1	0.9	1.3	-0.6	NA	NA	55	.73	.08	.07	.10	.08
	61	61	41	60	42			54	61				
077.	3.4	2.0	1.3	1.3	0.8	NA	NA	96	.63	.10	.06	.10	.07
	57	58	61	58	56			67	54				
078.	2.5	1.5	1.2	0.9	NA	NA	NA	31	.50	.10	.09	.12	.07
	49	49	56	50				46	45				
079.	2.3	1.4	0.9	0.8	0.3	NA	NA	36	.70	.13	.10	.08	.07
	47	48	42	46	51			48	59				
080.	2.9	1.7	1.0	1.1	-0.6	NA	NA	37	.59	.10	.08	.10	.07
	53	53	45	54	42			48	51				

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TABLE 6.1 Program Measures (Raw and Standardized Values) in History

Prog No.	University - Department/Academic Unit	Program Size			Characteristics of Program Graduates			
		(01)	(02)	(03)	(04)	(05)	(06)	(07)
081.	Saint Louis University	16	23	14	.11	11.0	.53	.06
	History	*41*	*45*	*42*	*39*	*37*	*47*	*39*
082.	South Carolina, University of-Columbia	29	23	28	.32	9.3	.76	.20
	History	*51*	*45*	*45*	*54*	*49*	*68*	*55*
083.	Southern California, University of	21	24	37	.27	8.3	.50	.18
	History	*45*	*46*	*47*	*50*	*57*	*45*	*53*
084.	Stanford University	30	56	91	.53	8.1	.58	.33
	History	*52*	*56*	*58*	*68*	*58*	*52*	*70*
085.	Syracuse University	24	28	26	.35	9.3	.46	.12
	History	*47*	*47*	*45*	*55*	*50*	*41*	*45*
086.	Temple University	39	24	99	.00	11.3	.72	.17
	History	*59*	*46*	*60*	*32*	*36*	*65*	*51*
087.	Tennessee, University of-Knoxville	22	19	20	.10	10.5	.79	.11
	History	*46*	*44*	*44*	*39*	*41*	*70*	*44*
088.	Texas Christian University	13	16	15	.22	7.0	.45	.05
	History	*38*	*43*	*43*	*47*	*65*	*40*	*38*
089.	Texas Tech University-Lubbock	22	19	23	.04	10.1	.61	.26
	History	*46*	*44*	*44*	*35*	*44*	*54*	*62*
090.	Texas, University of-Austin	51	55	57	.44	8.9	.61	.20
	History	*69*	*55*	*51*	*62*	*52*	*55*	*55*
091.	Toledo, University of	20	10	15	.10	8.5	.70	.20
	History	*44*	*41*	*43*	*39*	*55*	*62*	*55*
092.	Tulane University	18	32	74	.55	9.7	.49	.06
	History	*42*	*48*	*55*	*69*	*47*	*43*	*39*
093.	Utah, University of-Salt Lake City	34	18	56	.31	8.1	.46	.08
	History	*55*	*44*	*51*	*53*	*58*	*41*	*41*
094.	Vanderbilt University	23	17	32	.29	10.5	.65	.17
	History	*46*	*44*	*46*	*52*	*41*	*58*	*52*
095.	Virginia, University of	44	81	77	.35	8.5	.51	.12
	History	*63*	*63*	*55*	*56*	*55*	*45*	*45*
096.	Washington State University-Pullman	17	17	17	.15	8.9	.69	.23
	History	*42*	*44*	*43*	*43*	*52*	*62*	*58*
097.	Washington University-Saint Louis	23	22	19	.45	8.5	.63	.20
	History	*46*	*45*	*43*	*62*	*55*	*56*	*55*
098.	Washington, University of-Seattle	35	57	29	.34	7.6	.45	.19
	History	*56*	*56*	*45*	*55*	*61*	*40*	*53*
099.	Wayne State University	24	10	10	NA	NA	NA	NA
	History	*47*	*41*	*41*				
100.	West Virginia University	18	25	23	.04	9.7	.63	.07
	History	*42*	*46*	*44*	*35*	*47*	*56*	*40*

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TABLE 6.1 Program Measures (Raw and Standardized Values) in History

Prog No.	Survey Results (08)	Survey Results (09)	Survey Results (10)	Survey Results (11)	University Library (12)	Research Support (13)	Research Support (14)	Published Articles (17)	Published Articles (18)	Survey Ratings Standard Error (08)	Survey Ratings Standard Error (09)	Survey Ratings Standard Error (10)	Survey Ratings Standard Error (11)
081.	1.2	0.8	0.8	0.4	NA	NA	NA	10	.31	.17	.12	.12	.06
	37	36	38	36				39	32				
082.	2.4	1.4	1.4	0.5	-0.4	NA	NA	28	.62	.14	.10	.12	.07
	48	47	67	40	45			45	53				
083.	2.0	1.2	0.9	0.6	0.4	NA	NA	30	.67	.11	.10	.09	.06
	44	44	44	43	52			46	56				
084.	4.4	2.5	0.9	1.6	2.0	NA	NA	81	.80	.07	.06	.08	.06
	67	68	43	67	68			63	66				
085.	2.4	1.4	1.2	0.7	-0.3	NA	NA	36	.67	.12	.10	.07	.07
	48	48	56	45	45			48	56				
086.	2.6	1.5	1.2	0.9	-0.4	NA	NA	52	.49	.11	.09	.12	.07
	50	49	58	49	44			53	44				
087.	1.9	1.2	1.0	0.6	-0.4	NA	NA	17	.36	.13	.13	.11	.07
	43	43	48	41	44			42	35				
088.	1.0	0.7	1.0	0.5	NA	NA	NA	9	.39	.13	.11	.10	.07
	34	33	46	39				39	37				
089.	0.8	0.7	0.8	0.3	NA	NA	NA	29	.55	.13	.12	.09	.06
	33	34	38	36				46	48				
090.	3.5	2.0	1.3	1.4	1.6	NA	NA	82	.57	.10	.08	.10	.07
	59	59	61	60	64			63	50				
091.	1.7	1.0	1.1	0.7	NA	NA	NA	22	.70	.17	.12	.12	.08
	42	40	51	44				43	59				
092.	2.4	1.4	1.1	0.8	-1.0	NA	NA	31	.61	.13	.10	.14	.07
	48	47	51	46	38			46	52				
093.	1.7	1.2	1.2	0.4	-0.6	NA	NA	35	.41	.14	.12	.12	.07
	42	43	57	38	42			48	39				
094.	3.1	1.8	1.3	1.0	-0.7	NA	NA	38	.61	.10	.08	.10	.06
	55	55	61	52	41			49	52				
095.	3.7	2.2	1.3	1.5	0.7	NA	NA	75	.57	.09	.07	.08	.07
	60	62	64	64	56			61	49				
096.	1.1	0.9	0.9	0.4	-0.3	NA	NA	7	.35	.12	.16	.12	.07
	35	37	41	38	46			38	34				
097.	2.8	1.7	1.0	0.9	-0.4	NA	NA	26	.44	.10	.10	.11	.07
	52	53	46	50	45			45	40				
098.	3.4	2.0	1.1	1.3	1.5	NA	NA	35	.57	.08	.05	.08	.07
	58	59	53	59	63			48	50				
099.	1.8	1.0	0.8	0.6	-0.4	NA	NA	29	.38	.15	.12	.11	.07
	42	39	37	41	45			46	36				
100.	1.3	0.8	0.8	0.3	NA	NA	NA	10	.33	.12	.10	.14	.06
	37	35	38	35				39	33				

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TABLE 6.1 Program Measures (Raw and Standardized Values) in History

Prog No.	University - Department/Academic Unit	Program Size			Characteristics of Program Graduates			
		(01)	(02)	(03)	(04)	(05)	(06)	(07)
101.	Wisconsin, University of-Madison	53	137	247	.44	9.0	.56	.22
	History	*70*	*80*	*91*	*62*	*51*	*50*	*57*
102.	Yale University	51	109	93	.55	7.4	.60	.38
	History	*69*	*72*	*59*	*69*	*63*	*54*	*75*

* indicates program was initiated since 1970.

NOTE: On the first line of data for every program, raw values for each measure are reported; on the second line values are reported in standardized form, with mean = 50 and standard deviation = 10. "NA" indicates that the value for a measure is not available.

TABLE 6.1 Program Measures (Raw and Standardized Values) in History

Prog No.	Survey Results				University Library	Research Support		Published Articles		Survey Ratings Standard Error			
	(08)	(09)	(10)	(11)	(12)	(13)	(14)	(17)	(18)	(08)	(09)	(10)	(11)
101.	4.2	2.3	0.7	1.7	1.6	NA	NA	127	.62	.09	.09	.09	.06
	65	*64*	*32*	*69*	*64*			*78*	*53*				
102.	4.8	2.7	1.0	1.8	2.1	NA	NA	70	.63	.05	.06	.08	.05
	71	*71*	*49*	*71*	*69*			*59*	*54*				

NOTE: On the first line of data for every program, raw values for each measure are reported; on the second line values are reported in standardized form, with mean = 50 and standard deviation = 10. "NA" indicates that the value for a measure is not available.

TABLE 6.2 Summary Statistics Describing Each Program Measure--History

Measure	Number of Programs Evaluated	Mean	Standard Deviation	DECILES 1	2	3	4	5	6	7	8	9
Program Size												
01 Raw Value	102	28	13	14	17	19	22	24	27	31	36	48
Std Value	102	50	10	39	42	43	46	47	49	53	57	66
02 Raw Value	102	38	33	10	16	20	23	25	30	34	55	81
Std Value	102	50	10	41	43	44	45	46	48	49	55	63
03 Raw Value	102	51	48	12	19	26	29	35	42	55	70	100
Std Value	102	50	10	42	43	45	45	47	48	51	54	60
Program Graduates												
04 Raw Value	98	.26	.15	.06	.10	.17	.20	.27	.30	.35	.40	.46
Std Value	98	50	10	37	39	44	46	51	53	56	59	63
05 Raw Value	98	9.2	1.4	11.3	10.2	9.7	9.4	9.0	8.8	8.4	8.1	7.5
Std Value	98	50	10	35	43	47	49	51	53	56	58	62
06 Raw Value	98	.56	.11	.41	.46	.50	.53	.57	.60	.61	.64	.70
Std Value	98	50	10	36	41	45	47	51	54	55	57	63
07 Raw Value	98	.16	.09	.05	.08	.10	.13	.15	.17	.20	.22	.27
Std Value	98	50	10	38	41	43	47	49	51	54	57	62
Survey Results												
08 Raw Value	102	2.6	1.0	1.2	1.7	1.9	2.3	2.5	2.8	3.1	3.7	4.0
Std Value	102	50	10	36	41	43	47	49	52	55	60	63
09 Raw Value	102	1.6	.5	.8	1.0	1.2	1.4	1.5	1.7	1.8	2.1	2.2
Std Value	102	50	10	36	39	43	47	49	53	55	61	63
10 Raw Value	101	1.1	.2	.8	.9	.9	1.0	1.1	1.1	1.2	1.2	1.3
Std Value	101	50	10	38	43	43	48	52	52	57	57	62
11 Raw Value	102	.9	.4	.4	.5	.7	.7	.9	.9	1.2	1.3	1.6
Std Value	102	50	10	37	40	44	44	49	49	57	59	66
University Library												
12 Raw Value	75	.2	1.0	-1.0	-.6	-.4	-.4	-.1	.3	.7	.9	1.7
Std Value	75	50	10	39	42	44	44	47	51	55	57	65
Publication Records												
17 Raw Value	102	43	31	10	16	23	28	34	38	53	67	82
Std Value	102	50	10	39	41	44	45	47	49	53	58	63
18 Raw Value	101	.58	.14	.38	.46	.50	.56	.58	.61	.63	.70	.77
Std Value	101	50	10	36	41	44	49	50	52	54	59	64

NOTE: Standardized values reported in the preceding table have been computed from exact values of the mean and standard deviation and not the rounded values reported here.

TABLE 6.3 Intercorrelations Among Program Measures on 102 Programs in History

	Measure															
	01	02	03	04	05	06	07	08	09	10	11	12	13	14	17	18
Program Size																
01		.77	.75	.32	.02	.03	.32	.69	.66	.31	.68	.67	N/A	N/A	.86	.31
02			.83	.34	.07	.09	.43	.74	.72	.02	.77	.73	N/A	N/A	.82	.35
03				.34	.03	.02	.34	.66	.62	.04	.67	.57	N/A	N/A	.75	.26
Program Graduates																
04					.36	-.08	.40	.63	.63	.11	.57	.38	N/A	N/A	.39	.34
05						-.13	.33	.19	.22	.08	.23	.08	N/A	N/A	.08	.08
06							.38	.05	.04	-.09	.06	.07	N/A	N/A	.08	.14
07								.54	.52	-.07	.55	.44	N/A	N/A	.39	.31
Survey Results																
08									.98	.24	.97	.71	N/A	N/A	.79	.53
09										.23	.96	.69	N/A	N/A	.77	.53
10											.17	.06	N/A	N/A	.21	.03
11												.73	N/A	N/A	.79	.51
University Library																
12													N/A	N/A	.66	.37
Research Support																
13														N/A	N/A	N/A
14															N/A	N/A
Publication Records																
17																.60
18																

NOTE: Since in computing correlation coefficients program data must be available for both of the measures being correlated, the actual number of programs on which each coefficient is based varies.

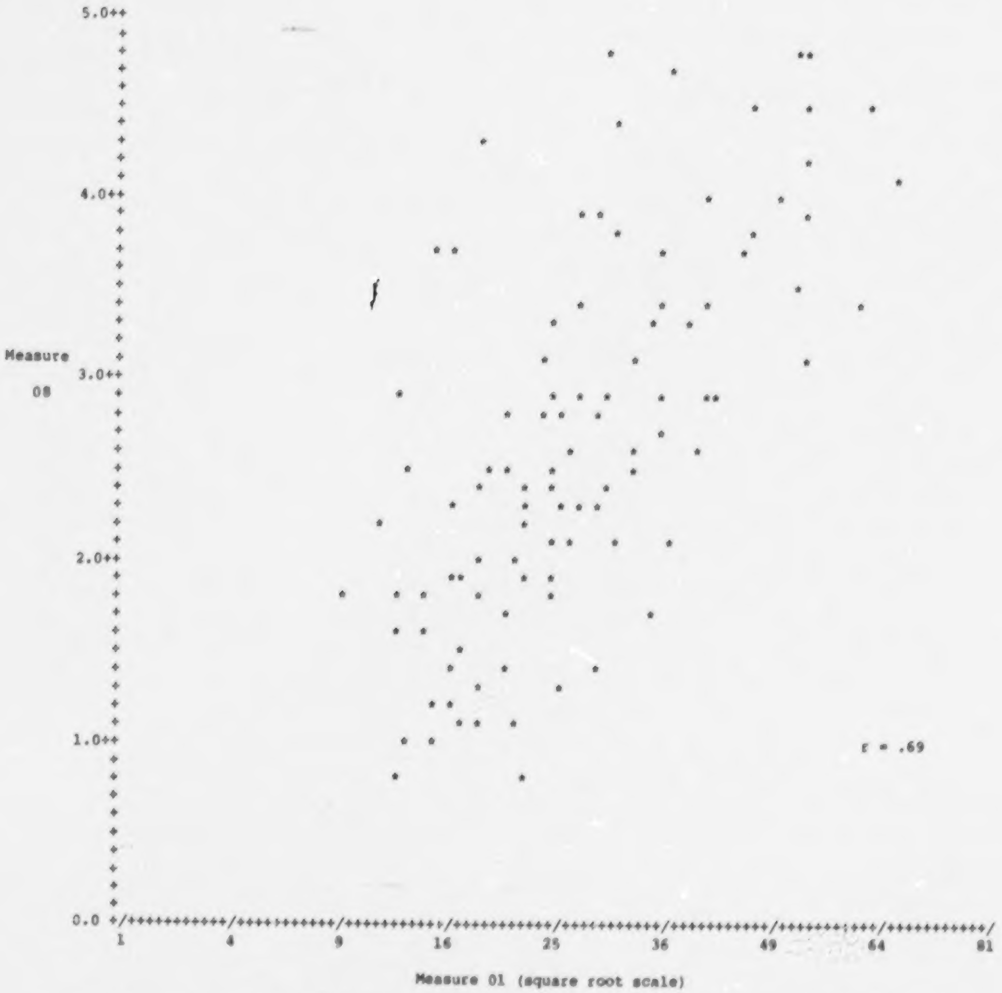

FIGURE 6.1 Mean rating of scholarly quality of faculty (measure 08) versus number of faculty members (measure 01)--102 programs in history.

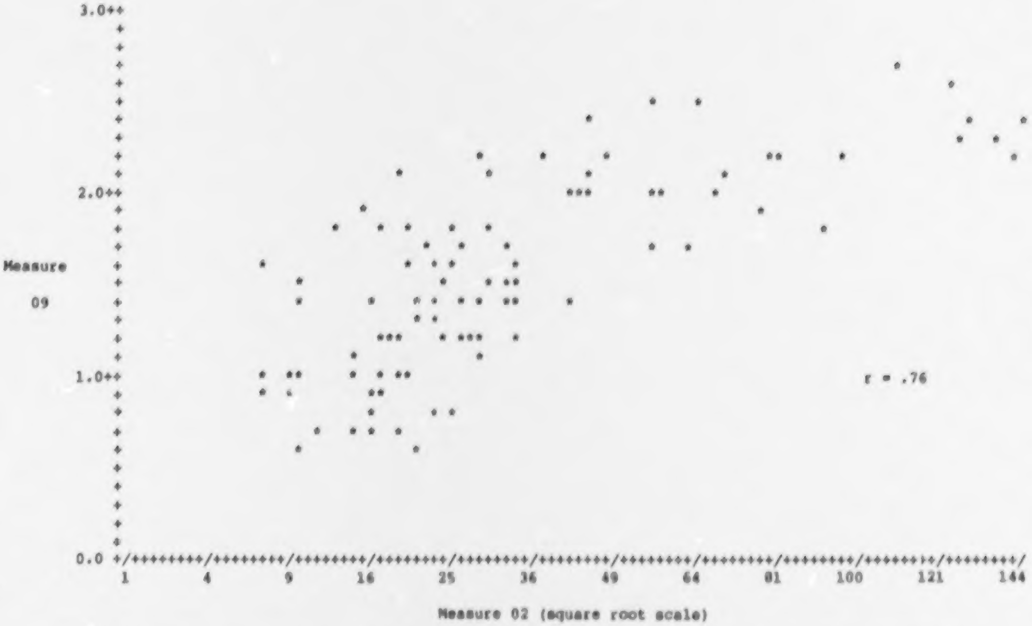

FIGURE 6.2 Mean rating of program effectiveness in educating research scholars/scientists (measure 09) versus number of graduates in last five years (measure 02)--102 programs in history.

TABLE 6.4 Characteristics of Survey Participants in History

	Respondents	
	N	%
Field of Specialization		
American History	78	47
European History	46	28
Other/Unknown	42	25
Faculty Rank		
Professor	92	55
Associate Professor	61	37
Assistant Professor	13	8
Year of Highest Degree		
Pre-1950	8	5
1950-59	43	26
1960-69	63	38
Post-1969	48	29
Unknown	4	2
Evaluator Selection		
Nominated by Institution	151	91
Other	15	9
Survey Form		
With Faculty Names	148	89
Without Names	18	11
Total Evaluators	166	100

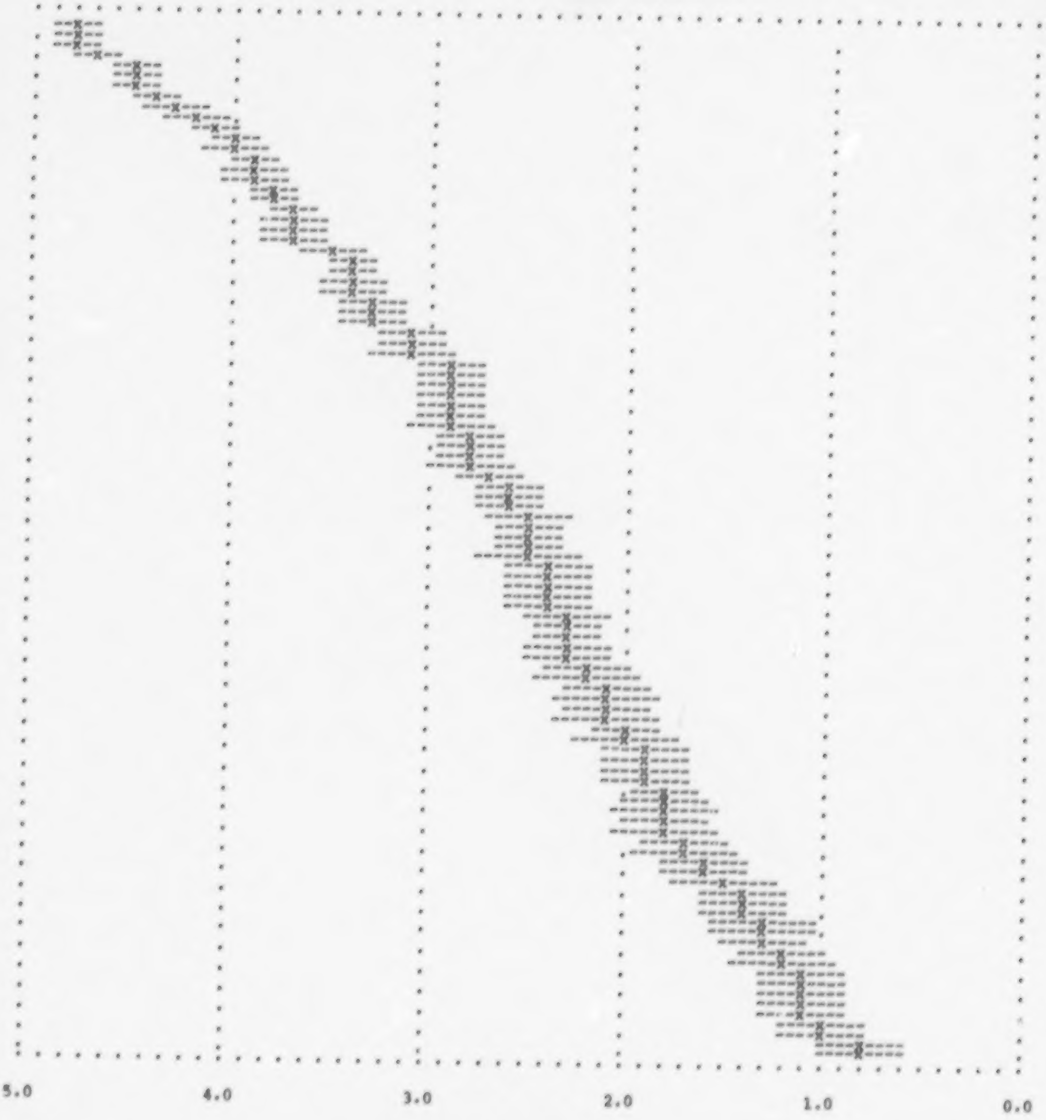

FIGURE 6.3 Mean rating of scholarly quality of faculty in 102 programs in history.

NOTE: Programs are listed in sequence of mean rating, with the highest-rated program appearing at the top of the page. The broken lines (---) indicate a confidence interval of ±1.5 standard errors around the reported mean (x) of each program.

VII

Political Science Programs

In this chapter 83 research-doctorate programs in political science are assessed. These programs, according to the information supplied by their universities, have accounted for 2,909 doctoral degrees awarded during the FY1976-80 period--approximately 86 percent of the aggregate number of political science and international relations doctorates earned from U.S. universities in this five-year span.[1] On the average, 50 full-time and part-time students intending to earn doctorates were enrolled in a program in December 1980, with an average faculty size of 23 members.[2] Five programs were initiated since 1970, and no two programs are located in the same university. In addition to the 83 institutions represented in this discipline, another 4 were initially identified as meeting the criteria[3] for inclusion in the assessment:

American University
University of Denver
University of Miami--Florida
Tufts University

Political science programs at these four institutions have not been included in the evaluations in this discipline, since in each case the study coordinator either indicated that the institution did not at that time have a research-doctorate program in political science or failed to provide the information requested by the committee.

Before examining individual program results presented in Table 7.1, the reader is urged to refer to Chapter II, in which each of the 16 measures used in the assessment is discussed. Summary statistics describing every measure are given in Table 7.2. For 14 of the measures, data are reported for at least 77 of the 83 political science programs. For measure 12, a composite index of the size of a university library, data are available for 71 programs; for measure 14, total university expenditures for research in this discipline, data are available for 58 programs. The programs not evaluated on measures 12 and 14 are typically smaller--in terms of faculty size and graduate student enrollment--than other political science programs. Were data on these two measures available for all 83 programs, it is likely that their reported means would be appreciably lower (and that some of the correlations of these measures with others would be higher).

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[1] Data from the NRC's Survey of Earned Doctorates indicate that 2,911 research doctorates in political science and 470 in international relations were awarded by U.S. universities between FY1976 and FY1980.

[2] See the reported means for measures 03 and 01 in Table 7.2.

[3] As mentioned in Chapter I, the primary criterion for inclusion was that a university had awarded at least 10 doctorates in political science during the FY1976-78 period.

Intercorrelations among the 16 measures (Pearson product-moment coefficients) are given in Table 7.3. Of particular note are the high positive correlations of the measures of the number of program faculty (01) and the number of recent graduates (02) with the total published articles by program faculty (17) and the reputational survey ratings (08 and 09). Also of interest are the high positive correlations of university library size (12) with survey results (08 and 09). Figure 7.1 illustrates the relation between the mean rating of the scholarly quality of faculty (measure 08) and the number of faculty members (measure 01) for each of 83 programs in political science. Figure 7.2 plots the mean rating of program effectiveness (measure 09) against the total number of FY1976-80 program graduates (measure 02). Although in both figures there is a significant positive correlation between program size and reputational rating, it is quite apparent that some of the smaller programs received high mean ratings and that some of the larger programs received low mean ratings.

Table 7.4 describes the 152 faculty members who participated in the evaluation of political science programs. These individuals constituted 61 percent of those asked to respond to the survey in this discipline and 8 percent of the faculty population in the 83 research-doctorate programs being evaluated.[4] A majority of the survey participants had earned their highest degree since 1970, and a majority held the rank of full professor.

To assist the reader in interpreting results of the survey evaluations, estimated standard errors have been computed for mean ratings of the scholarly quality of faculty in 83 political science programs (and are given in Table 7.1). For each program the mean rating and an associated "confidence interval" of 1.5 standard errors are illustrated in Figure 7.3 (listed in order of highest to lowest mean rating). In comparing two programs, if their confidence intervals do not overlap, one may conclude that there is a significant difference in their mean ratings at a .05 level of significance.[5] From this figure it is also apparent that one should have somewhat more confidence in the accuracy of the mean ratings of higher-rated programs than lower-rated programs. This generalization results primarily from the fact that evaluators are not as likely to be familiar with the less prestigious programs, and consequently the mean ratings of these programs are usually based on fewer survey responses.

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[4] See Table 2.3 in Chapter II.

[5] See pp. 30-32 for a discussion of the interpretation of mean ratings and associated confidence intervals.

TABLE 7.1 Program Measures (Raw and Standardized Values) in Political Science

Prog No.	University - Department/Academic Unit	Program Size			Characteristics of Program Graduates			
		(01)	(02)	(03)	(04)	(05)	(06)	(07)
001.	Arizona, University of-Tucson	26	16	18	.39	8.5	.72	.11
	*Political Science**	*54*	*43*	*42*	*57*	*49*	*53*	*40*
002.	Atlanta University	8	16	36	NA	NA	NA	NA
	*Political Science**	*33*	*43*	*47*				
003.	Boston University	19	17	34	.08	7.1	.25	.08
	Political Science	*46*	*43*	*46*	*36*	*59*	*17*	*38*
004.	Brandeis University	13	18	17	.43	7.6	.76	.38
	Politics	*39*	*44*	*42*	*60*	*55*	*56*	*59*
005.	CUNY-Graduate School	35	38	90	.09	9.3	.56	.08
	Political Science	*64*	*51*	*59*	*37*	*43*	*40*	*38*
006.	California, University of-Berkeley	46	83	116	.51	9.1	.74	.36
	Political Science	*77*	*67*	*65*	*66*	*44*	*54*	*57*
007.	California, University of-Davis	21	7	28	.40	8.1	.60	.10
	Political Science	*48*	*40*	*45*	*58*	*52*	*44*	*39*
008.	California, University of-Los Angeles	46	43	48	.35	10.0	.71	.33
	Political Science	*77*	*53*	*49*	*55*	*38*	*53*	*55*
009.	California, University of-Riverside	13	31	40	.12	6.8	.48	.11
	Political Science	*39*	*48*	*48*	*39*	*61*	*35*	*40*
010.	California, University of-San Diego	17	NA	2	NA	NA	NA	NA
	*Political Science**	*44*		*39*				
011.	California, University of-Santa Barbara	24	52	40	.24	7.4	.73	.22
	Political Science	*52*	*56*	*48*	*47*	*56*	*54*	*47*
012.	Catholic University of America	15	13	64	NA	NA	NA	NA
	Politics	*41*	*42*	*53*				
013.	Chicago, University of	27	110	103	.47	8.9	.72	.32
	Political Science	*55*	*77*	*62*	*63*	*46*	*53*	*54*
014.	Cincinnati, University of	15	20	30	.15	7.8	.74	.21
	Political Science	*41*	*44*	*45*	*41*	*54*	*54*	*47*
015.	Claremont Graduate School	25	148	169	.14	8.0	.49	.08
	Government	*53*	*91*	*78*	*41*	*52*	*35*	*38*
016.	Colorado, University of	24	22	48	.17	9.3	.72	.24
	Political Science	*52*	*45*	*49*	*43*	*43*	*53*	*49*
017.	Columbia University	35	129	302	.40	9.5	.68	.22
	Political Science	*64*	*84*	*99*	*58*	*41*	*50*	*47*
018.	Connecticut, University of-Storrs	20	25	19	.44	9.1	.78	.17
	Political Science	*47*	*46*	*43*	*61*	*44*	*58*	*44*
019.	Cornell University-Ithaca	28	40	48	.32	7.8	.82	.41
	Government	*56*	*52*	*49*	*53*	*54*	*61*	*61*
020.	Duke University	23	31	40	.41	7.6	.59	.11
	Political Science	*50*	*48*	*48*	*59*	*56*	*43*	*40*

* indicates program was initiated since 1970.

NOTE: On the first line of data for every program, raw values for each measure are reported; on the second line values are reported in standardized form, with mean = 50 and standard deviation = 10. "NA" indicates that the value for a measure is not available.

TABLE 7.1 Program Measures (Raw and Standardized Values) in Political Science

Prog No.	Survey Results				University Library	Research Support		Published Articles		Survey Ratings Standard Error			
	(08)	(09)	(10)	(11)	(12)	(13)	(14)	(17)	(18)	(08)	(09)	(10)	(11)
001.	2.5	1.4	1.7	0.9	0.9	.00	171	65	.73	.10	.10	.07	.07
	50	48	78	48	57	41	46	58	57				
002.	0.4	0.3	0.9	0.2	NA	NA	NA	3	NA	.08	.08	.12	.04
	27	28	41	31				35					
003.	2.2	1.2	0.7	0.9	-0.4	.00	31	54	.74	.11	.10	.10	.06
	46	44	35	47	44	41	44	54	58				
004.	2.6	1.4	0.8	1.0	NA	.00	30	18	.77	.10	.09	.07	.06
	50	48	38	50		41	44	41	60				
005.	3.1	1.5	0.9	1.1	NA	.00	256	33	.46	.11	.10	.08	.07
	55	50	41	52		41	47	46	38				
006.	4.7	2.4	1.0	1.8	2.2	.11	3541	96	.61	.06	.06	.07	.04
	71	67	49	70	70	56	86	70	49				
007.	2.3	1.3	1.3	0.7	0.6	.05	423	54	.81	.10	.10	.11	.06
	47	46	60	44	54	48	49	54	63				
008.	3.5	2.0	1.1	1.3	2.0	.00	1243	92	.59	.08	.07	.07	.07
	59	59	50	59	68	41	59	68	47				
009.	2.0	1.0	0.8	0.8	-1.0	.00	NA	22	.54	.12	.11	.08	.07
	44	41	38	46	38	41		42	44				
010.	2.9	1.6	1.9	1.2	-0.0	.24	NA	20	.47	.09	.10	.05	.07
	53	53	86	56	47	74		41	39				
011.	2.7	1.4	1.1	1.1	-0.1	.13	429	49	.71	.09	.08	.07	.06
	51	50	50	53	47	59	49	52	56				
012.	1.4	0.8	1.2	0.5	NA	.07	NA	23	.53	.11	.10	.10	.06
	38	37	55	38		50		42	44				
013.	4.5	2.4	1.0	1.8	0.9	.15	244	85	.93	.08	.08	.09	.05
	70	68	47	69	56	62	47	66	70				
014.	1.5	0.8	1.0	0.6	-0.2	.07	NA	19	.47	.11	.10	.10	.06
	39	38	49	40	45	50		41	39				
015.	2.2	1.3	0.8	0.8	NA	.04	NA	21	.40	.13	.10	.09	.07
	46	47	39	44		47		42	35				
016.	2.1	1.2	1.1	0.6	-0.9	.13	68	34	.58	.10	.11	.08	.06
	45	45	52	39	39	59	45	47	47				
017.	3.6	1.8	0.9	1.4	1.7	.00	466	56	.69	.10	.07	.08	.07
	60	56	44	60	65	41	49	55	54				
018.	2.3	1.2	1.0	0.9	-0.5	.05	54	27	.55	.11	.10	.07	.06
	47	45	49	47	43	48	45	44	45				
019.	3.7	2.1	1.3	1.5	1.6	.04	625	78	.82	.09	.07	.08	.06
	62	62	59	63	64	46	51	63	63				
020.	3.4	1.8	1.4	1.4	0.3	.04	341	54	.78	.08	.06	.07	.06
	58	57	64	60	51	47	48	54	61				

NOTE: On the first line of data for every program, raw values for each measure are reported; on the second line values are reported in standardized form, with mean = 50 and standard deviation = 10. "NA" indicates that the value for a measure is not available.

TABLE 7.1 Program Measures (Raw and Standardized Values) in Political Science

Prog No.	University - Department/Academic Unit	Program Size			Characteristics of Program Graduates			
		(01)	(02)	(03)	(04)	(05)	(06)	(07)
021.	Emory University	14	13	20	NA	NA	NA	NA
	Political Science	*40*	*42*	*43*				
022.	Florida State University-Tallahassee	19	41	61	.17	5.2	.78	.47
	Government	*46*	*52*	*52*	*43*	*73*	*58*	*65*
023.	Florida, University of-Gainesville	23	21	72	.33	7.6	.81	.29
	Political Science	*50*	*45*	*55*	*54*	*55*	*60*	*52*
024.	George Washington University	22	25	60	.27	11.5	.63	.17
	Political Science	*49*	*46*	*52*	*49*	*27*	*46*	*44*
025.	Georgetown University	13	22	62	.27	10.5	.79	.11
	Political Science	*39*	*45*	*53*	*50*	*34*	*58*	*40*
026.	Georgia, University of-Athens	16	28	31	.14	8.0	.87	.50
	Political Science	*42*	*47*	*45*	*41*	*52*	*64*	*67*
027.	Harvard University	23	109	158	.43	7.3	.81	.41
	Government	*50*	*77*	*75*	*60*	*58*	*60*	*61*
028.	Hawaii, University of	28	45	68	.26	9.6	.41	.09
	Political Science	*56*	*53*	*54*	*48*	*41*	*29*	*39*
029.	Howard University	20	31	50	.20	6.3	.46	.17
	Political Science	*47*	*48*	*50*	*45*	*65*	*33*	*44*
030.	Idaho, University of-Moscow	7	10	11	NA	NA	NA	NA
	Political Science & Public Affairs Research	*32*	*41*	*41*				
031.	Illinois, University-Urbana/Champaign	29	48	45	.26	7.8	.76	.40
	Political Science	*57*	*55*	*49*	*48*	*54*	*56*	*59*
032.	Indiana University-Bloomington	35	65	84	.39	9.0	.88	.46
	Political Science	*64*	*61*	*58*	*58*	*45*	*66*	*64*
033.	Iowa, University of-Iowa City	19	21	27	.21	5.8	.83	.54
	Political Science	*46*	*45*	*45*	*45*	*68*	*62*	*69*
034.	Johns Hopkins University	10	34	40	.46	7.9	.70	.22
	Political Science	*36*	*49*	*48*	*62*	*53*	*52*	*47*
035.	Kansas, University of	28	17	51	.29	10.6	.82	.18
	Political Science	*56*	*43*	*50*	*51*	*33*	*61*	*45*
036.	Kent State University	21	17	23	.20	6.4	.87	.13
	Political Science	*48*	*43*	*44*	*45*	*64*	*64*	*42*
037.	Kentucky, University of	16	16	34	.25	8.0	.77	.35
	Political Science	*42*	*43*	*46*	*48*	*52*	*57*	*57*
038.	Maryland, University of-College Park	34	34	87	.13	9.3	.58	.18
	Government and Politics	*63*	*49*	*59*	*40*	*43*	*42*	*44*
039.	Massachusetts Institute of Technology	29	70	106	.53	7.6	.81	.46
	Political Science	*57*	*63*	*63*	*67*	*56*	*60*	*64*
040.	Massachusetts, University of-Amherst	26	29	75	.16	10.1	.76	.17
	Political Science	*54*	*48*	*56*	*42*	*37*	*56*	*44*

* indicates program was initiated since 1970.

NOTE: On the first line of data for every program, raw values for each measure are reported; on the second line values are reported in standardized form, with mean = 50 and standard deviation = 10. "NA" indicates that the value for a measure is not available.

TABLE 7.1 Program Measures (Raw and Standardized Values) in Political Science

Prog No.	Survey Results				University Library	Research Support		Published Articles		Survey Ratings Standard Error			
	(08)	(09)	(10)	(11)	(12)	(13)	(14)	(17)	(18)	(08)	(09)	(10)	(11)
021.	1.4	0.9	1.2	0.5	-0.6	.00	NA	12	.43	.12	.10	.14	.06
	38	*39*	*58*	*37*	*42*	*41*		*38*	*37*				
022.	2.4	1.5	1.4	1.0	-0.4	.11	161	47	.63	.12	.10	.09	.08
	49	*50*	*64*	*49*	*43*	*56*	*46*	*51*	*50*				
023.	2.2	1.2	1.0	0.6	0.8	.09	NA	21	.52	.12	.10	.08	.06
	46	*44*	*48*	*41*	*55*	*53*		*42*	*43*				
024.	1.9	1.1	1.2	0.7	NA	.05	NA	40	.68	.12	.10	.09	.06
	43	*43*	*55*	*43*		*47*		*49*	*54*				
025.	2.0	1.1	0.9	0.9	-0.6	.00	NA	34	.77	.11	.10	.07	.06
	44	*44*	*44*	*47*	*41*	*41*		*47*	*60*				
026.	2.4	1.4	1.4	0.9	0.4	.00	350	64	.94	.11	.10	.09	.07
	48	*49*	*63*	*49*	*52*	*41*	*48*	*58*	*71*				
027.	4.7	2.4	1.1	1.8	3.0	.09	618	68	.87	.06	.08	.07	.04
	71	*67*	*50*	*71*	*78*	*53*	*51*	*59*	*67*				
028.	3.1	1.6	1.1	1.2	-0.1	.04	4	40	.64	.10	.09	.08	.07
	55	*53*	*54*	*56*	*46*	*46*	*44*	*49*	*51*				
029.	1.2	0.7	1.0	0.3	-0.4	.00	NA	9	.25	.13	.12	.13	.05
	36	*35*	*47*	*32*	*44*	*41*		*37*	*24*				
030.	0.4	0.3	1.1	0.3	NA	NA	104	7	NA	.10	.09	.10	.05
	28	*29*	*50*	*32*			*45*	*36*					
031.	3.2	1.9	1.4	1.3	2.0	.00	224	84	.66	.09	.07	.09	.06
	57	*59*	*67*	*58*	*67*	*41*	*47*	*65*	*52*				
032.	3.4	2.0	1.2	1.3	0.9	.14	656	78	.80	.08	.06	.09	.06
	59	*60*	*57*	*59*	*57*	*61*	*52*	*63*	*62*				
033.	3.1	1.9	1.0	1.2	0.3	.11	100	26	.68	.10	.07	.09	.07
	55	*58*	*48*	*54*	*51*	*56*	*45*	*44*	*54*				
034.	3.2	1.8	0.9	1.3	-0.4	.30	511	21	.60	.10	.08	.08	.06
	56	*56*	*44*	*58*	*44*	*83*	*50*	*42*	*48*				
035.	2.0	1.1	1.1	0.5	0.1	.00	41	27	.50	.10	.09	.09	.06
	44	*43*	*52*	*39*	*49*	*41*	*44*	*44*	*41*				
036.	1.3	0.8	1.1	0.4	-1.8	.00	NA	20	.43	.12	.11	.10	.06
	37	*39*	*50*	*35*	*30*	*41*		*41*	*37*				
037.	2.6	1.6	1.1	1.0	-0.1	.19	NA	50	.81	.10	.09	.07	.06
	50	*53*	*53*	*51*	*47*	*67*		*53*	*63*				
038.	2.7	1.6	1.2	1.2	0.2	.00	71	70	.65	.08	.08	.10	.07
	51	*52*	*57*	*54*	*49*	*41*	*45*	*60*	*51*				
039.	4.3	2.4	1.0	1.6	-0.3	.10	1251	49	.55	.08	.08	.07	.06
	67	*67*	*48*	*65*	*44*	*55*	*59*	*52*	*45*				
040.	2.8	1.6	1.2	1.1	-0.7	.04	75	55	.65	.09	.09	.07	.06
	53	*52*	*54*	*52*	*41*	*46*	*45*	*54*	*52*				

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TABLE 7.1 Program Measures (Raw and Standardized Values) in Political Science

Prog No.	University - Department/Academic Unit	Program Size			Characteristics of Program Graduates			
		(01)	(02)	(03)	(04)	(05)	(06)	(07)
041.	Miami University-Ohio	16	22	15	.10	7.3	.70	.05
	Political Science	*42*	*45*	*42*	*38*	*58*	*52*	*36*
042.	Michigan State University-East Lansing	23	17	34	.16	8.0	.80	.40
	Political Science	*50*	*43*	*46*	*42*	*52*	*59*	*60*
043.	Michigan, University of-Ann Arbor	50	100	107	.43	8.7	.77	.45
	Political Science	*81*	*73*	*63*	*60*	*47*	*57*	*63*
044.	Minnesota, University of	28	48	28	.28	7.4	.68	.41
	Political Science	*56*	*55*	*45*	*50*	*57*	*50*	*60*
045.	Missouri, University of-Columbia	19	31	38	.25	9.5	.78	.11
	Political Science	*46*	*48*	*47*	*48*	*41*	*58*	*40*
046.	Nebraska, University of-Lincoln	21	13	25	.08	8.5	.70	.50
	Political Science	*48*	*42*	*44*	*37*	*49*	*52*	*67*
047.	New School for Social Research	6	38	56	.12	11.0	.56	.09
	Political Science	*31*	*51*	*51*	*39*	*30*	*41*	*39*
048.	New York University	23	58	30	.19	10.7	.58	.08
	Politics	*50*	*58*	*45*	*44*	*33*	*42*	*38*
049.	North Carolina, University of-Chapel Hill	33	66	64	.42	8.3	.72	.32
	Political Science	*62*	*61*	*53*	*59*	*51*	*53*	*54*
050.	Northern Illinois University-De Kalb	12	24	47	.15	8.3	.74	.21
	Political Science	*38*	*46*	*49*	*41*	*50*	*54*	*47*
051.	Northwestern University	28	33	35	.37	6.5	.68	.42
	Political Science	*56*	*49*	*46*	*56*	*63*	*50*	*61*
052.	Notre Dame, University of	14	24	44	.12	10.0	.56	.00
	Government and International Studies	*40*	*46*	*49*	*39*	*38*	*41*	*33*
053.	Ohio State University-Columbus	26	76	79	.04	5.9	.73	.44
	Political Science	*54*	*65*	*57*	*34*	*68*	*54*	*62*
054.	Oklahoma, University of-Norman	28	35	41	.11	8.0	.67	.39
	Political Science	*56*	*50*	*48*	*39*	*52*	*49*	*59*
055.	Oregon, University of-Eugene	18	21	21	.41	9.3	.59	.22
	Political Science	*45*	*45*	*43*	*59*	*43*	*43*	*48*
056.	Pennsylvania State University	19	13	19	.30	8.5	.64	.00
	Political Science	*46*	*42*	*43*	*51*	*49*	*47*	*33*
057.	Pennsylvania, University of	20	20	17	.42	10.8	.48	.28
	*Political Science**	*47*	*44*	*42*	*60*	*32*	*35*	*52*
058.	Pittsburgh, University of	25	25	39	.34	9.7	.79	.18
	Political Science	*53*	*46*	*47*	*54*	*40*	*58*	*45*
059.	Princeton University	23	46	64	.40	8.2	.78	.22
	Political Science	*50*	*54*	*53*	*58*	*51*	*58*	*48*
060.	Purdue University-West Lafayette	22	17	24	.13	6.5	.53	.27
	Political Science	*49*	*43*	*44*	*40*	*63*	*39*	*51*

* indicates program was initiated since 1970.

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TABLE 7.1 Program Measures (Raw and Standardized Values) in Political Science

Prog No.	Survey Results				University Library	Research Support		Published Articles		Survey Ratings Standard Error			
	(08)	(09)	(10)	(11)	(12)	(13)	(14)	(17)	(18)	(08)	(09)	(10)	(11)
041.	1.7	0.9	0.9	0.6	-0.8	.00	NA	14	.31	.13	.11	.10	.06
	41	40	43	41	40	41		39	29				
042.	2.8	1.7	0.7	1.2	0.3	.09	251	53	.70	.09	.06	.07	.06
	52	55	33	54	51	53	47	54	55				
043.	4.6	2.5	1.0	1.8	1.8	.28	5154	151	.84	.06	.05	.07	.05
	70	69	48	69	66	80	99	90	65				
044.	3.8	2.3	1.3	1.6	1.2	.11	468	43	.61	.07	.06	.08	.06
	62	66	61	64	59	56	49	50	49				
045.	2.0	1.1	1.0	0.7	-0.2	.11	4	30	.74	.12	.10	.07	.07
	44	43	45	42	46	56	44	45	58				
046.	1.8	1.0	1.2	0.6	-0.5	.05	59	55	.62	.12	.10	.10	.06
	42	41	56	40	43	48	45	54	50				
047.	1.0	0.6	0.4	0.6	NA	NA	NA	2	NA	.15	.10	.09	.07
	34	35	20	41				35					
048.	2.6	1.4	0.9	0.9	0.5	.04	652	31	.48	.08	.08	.08	.06
	50	49	44	48	52	47	52	45	40				
049.	3.6	2.1	0.9	1.4	1.0	.12	22	49	.58	.07	.05	.07	.06
	60	62	41	60	58	58	44	52	47				
050.	1.3	0.8	1.0	0.5	NA	.08	538	22	.58	.11	.11	.11	.06
	37	37	45	38		53	50	42	47				
051.	3.6	2.1	1.0	1.3	0.3	.11	224	53	.68	.08	.07	.08	.07
	60	62	47	59	51	56	47	54	54				
052.	2.0	1.1	1.1	0.7	-1.3	.00	NA	31	.79	.12	.11	.08	.06
	44	44	51	42	34	41		45	61				
053.	3.3	1.9	1.4	1.3	0.9	.19	559	74	.85	.08	.07	.08	.07
	57	59	67	59	56	68	50	62	65				
054.	1.7	1.1	1.2	0.4	-0.6	.00	564	44	.50	.11	.10	.10	.06
	41	44	55	36	42	41	51	50	41				
055.	2.7	1.6	0.9	1.1	-0.9	.11	NA	14	.44	.10	.08	.08	.07
	51	53	41	52	38	57		39	38				
056.	2.3	1.4	0.8	0.8	0.7	.11	229	60	.79	.10	.11	.07	.05
	47	48	39	45	55	56	47	56	61				
057.	2.8	1.4	0.7	1.1	0.7	.05	1881	62	.50	.09	.09	.08	.06
	53	49	33	53	54	48	66	57	41				
058.	2.8	1.8	1.0	1.1	0.1	.00	168	60	.84	.10	.07	.09	.07
	52	55	47	52	48	41	46	56	65				
059.	3.9	2.1	0.9	1.6	0.9	.04	1747	54	.61	.09	.07	.08	.06
	63	61	44	65	57	47	64	54	49				
060.	2.1	1.1	1.1	0.9	-0.5	.00	30	26	.59	.09	.08	.08	.06
	45	43	51	47	42	41	44	44	48				

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TABLE 7.1 Program Measures (Raw and Standardized Values) in Political Science

Prog No.	University - Department/Academic Unit	Program Size (01)	Program Size (02)	Program Size (03)	Characteristics of Program Graduates (04)	Characteristics of Program Graduates (05)	Characteristics of Program Graduates (06)	Characteristics of Program Graduates (07)
061.	Rice University	10	9	9	.17	6.8	.58	.25
	*Political Science**	*36*	*40*	*40*	*43*	*62*	*43*	*50*
062.	Rochester, University of	15	20	26	.48	7.0	.70	.44
	Political Science	*41*	*44*	*44*	*64*	*60*	*52*	*63*
063.	Rutgers, The State University-New Brunswick	47	60	96	.20	7.7	.60	.22
	Political Science	*78*	*59*	*61*	*44*	*55*	*44*	*48*
064.	SUNY at Albany	25	14	60	.25	11.0	.60	.20
	Political Science	*53*	*42*	*52*	*48*	*30*	*44*	*46*
065.	SUNY at Binghamton	11	25	25	.19	7.6	.32	.00
	Political Science	*37*	*46*	*44*	*44*	*55*	*22*	*33*
066.	SUNY at Buffalo	22	27	35	.40	7.0	.77	.37
	Political Science	*49*	*47*	*46*	*58*	*60*	*57*	*58*
067.	Southern California, University of	18	17	42	.19	7.5	.53	.07
	Political Science	*45*	*43*	*48*	*44*	*56*	*39*	*37*
068.	Southern Illinois University-Carbondale	[illegible]	24	13	.08	8.5	.65	.31
	Political Science	*47*	*46*	*41*	*37*	*49*	*48*	*54*
069.	Stanford University	24	43	58	.64	8.7	.70	.34
	Political Science	*52*	*53*	*52*	*74*	*47*	*51*	*56*
070.	Syracuse University	25	24	31	.13	5.9	.74	.19
	Political Science	*53*	*46*	*45*	*40*	[illegible]	*55*	*46*
071.	Temple University	16	14	60	.08	10.0	.62	.15
	Political Science	*42*	*42*	*52*	*36*	*38*	*45*	*43*
072.	Tennessee, University of-Knoxville	19	23	24	.04	9.0	.67	.37
	Political Science	*46*	*45*	*44*	*34*	*45*	*49*	*58*
073.	Texas, University of-Austin	37	37	63	.32	9.3	.77	.34
	Government	*66*	*51*	*53*	*53*	*43*	*57*	*56*
074.	Tulane University	12	7	13	.55	8.6	.50	.10
	Political Science	*38*	*40*	*41*	*68*	*48*	*36*	*39*
075.	Utah, University of-Salt Lake City	19	16	16	.09	7.8	.55	.09
	Political Science	*46*	*43*	*42*	*37*	*54*	*40*	*39*
076.	Vanderbilt University	19	9	19	.60	8.5	.90	.40
	Political Science	*46*	*40*	*43*	*72*	*49*	*67*	*60*
077.	Virginia, University of	28	48	22	.32	6.1	.51	.26
	Government and Foreign Affairs	*56*	*55*	*43*	*53*	*66*	*37*	*50*
078.	Washington University-Saint Louis	18	17	19	.38	8.0	.67	.33
	Political Science	*45*	*43*	*43*	*57*	*52*	*49*	*55*
079.	Washington, University of-Seattle	22	41	26	.30	9.2	.57	.23
	Political Science	*49*	*52*	*44*	*51*	*44*	*41*	*48*
080.	West Virginia University	22	18	8	.11	10.0	.71	.00
	Political Science	*49*	*44*	*40*	*39*	*38*	*52*	*33*

* indicates program was initiated since 1970.

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TABLE 7.1 Program Measures (Raw and Standardized Values) in Political Science

Prog No.	Survey Results				University Library	Research Support		Published Articles		Survey Ratings Standard Error			
	(08)	(09)	(10)	(11)	(12)	(13)	(14)	(17)	(18)	(08)	(09)	(10)	(11)
061.	1.6	1.0	1.1	0.6	-1.4	.00	NA	19	.80	.13	.12	.11	.07
	40	*42*	*51*	*42*	*33*	*41*		*41*	*62*				
062.	3.7	2.3	1.1	1.5	-0.6	.20	NA	29	.53	.08	.07	.06	.06
	61	*65*	*52*	*62*	*41*	*69*		*45*	*44*				
063.	3.0	1.7	1.3	1.2	0.8	.02	1356	70	.60	.08	.07	.08	.06
	54	*55*	*59*	*54*	*56*	*44*	*60*	*60*	*48*				
064.	2.0	1.2	1.1	0.7	-1.0	.08	NA	59	.76	.10	.10	.08	.06
	44	*45*	*51*	*43*	*38*	*52*		*56*	*59*				
065.	2.0	1.2	1.2	0.8	NA	.09	422	9	.46	.12	.10	.10	.07
	44	*45*	*54*	*45*		*54*	*49*	*37*	*38*				
066.	2.5	1.5	0.8	0.9	0.3	.00	NA	45	.55	.10	.09	.08	.06
	49	*51*	*38*	*48*	*50*	*41*		*51*	*44*				
067.	2.6	1.3	1.2	1.0	0.4	.06	65	33	.78	.10	.09	.09	.06
	50	*47*	*56*	*51*	*51*	*49*	*45*	*46*	*60*				
068.	1.2	0.7	0.8	0.6	-0.2	.10	12	39	.45	.11	.10	.10	.06
	36	*36*	*37*	*41*	*46*	*55*	*44*	*48*	*38*				
069.	4.2	2.4	0.8	1.7	2.0	.00	125	55	.75	.08	.06	.08	.05
	66	*67*	*39*	*67*	*68*	*41*	*45*	*54*	*58*				
070.	2.5	1.6	0.9	1.0	-0.3	.12	337	36	.60	.09	.08	.08	.07
	49	*52*	*41*	*50*	*44*	*58*	*48*	*47*	*48*				
071.	2.1	1.1	0.9	0.9	-0.4	.00	16	28	.56	.11	.10	.08	.07
	45	*44*	*43*	*47*	*43*	*41*	*44*	*44*	*46*				
072.	1.8	0.9	1.1	0.6	-0.4	.00	18	24	.53	.12	.09	.10	.06
	42	*40*	*50*	*39*	*44*	*41*	*44*	*43*	*43*				
073.	3.0	1.7	1.0	1.0	1.6	.03	1115	69	.54	[illegible]	.08	.11	.06
	54	*54*	*46*	*51*	*64*	*45*	*57*	*60*	*44*				
074.	1.4	0.9	0.9	0.6	-1.0	.00	NA	17	.67	.14	.12	.12	.06
	38	*39*	*41*	*39*	*37*	*41*		*40*	*53*				
075.	1.1	0.6	1.0	0.3	-0.6	.00	NA	13	.47	.12	.11	.04	.05
	35	*33*	*45*	*34*	*41*	*41*		*39*	*40*				
076.	2.8	1.6	1.0	1.1	-0.7	.00	NA	21	.47	.09	.09	.08	.07
	52	*52*	*49*	*52*	*40*	*41*		*42*	*40*				
077.	2.7	1.6	1.2	1.0	0.7	.00	249	51	.61	.09	.08	.09	.07
	52	*52*	*58*	*49*	*55*	*41*	[illegible]	*53*	*49*				
078.	3.3	2.1	1.3	1.3	-0.4	.06	NA	[illegible]	.44	.08	.07	.08	.06
	57	*61*	*59*	*58*	*44*	*49*		*39*	*38*				
079.	3.0	1.6	1.4	1.2	1.5	.09	393	36	.55	.08	.08	.08	.07
	54	*53*	*66*	*55*	*62*	*54*	*49*	*47*	*44*				
080.	1.0	0.6	1.1	0.3	NA	.00	385	18	.36	.12	.10	.10	.05
	34	*34*	*52*	*34*		*41*	*48*	*41*	*32*				

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TABLE 7.1 Program Measures (Raw and Standardized Values) in Political Science

Prog No.	University - Department/Academic Unit	Program Size			Characteristics of Program Graduates			
		(01)	(02)	(03)	(04)	(05)	(06)	(07)
081.	Wisconsin, University of-Madison	36	56	111	.54	7.4	.79	.48
	Political Science	*65*	*57*	*64*	*68*	*57*	*58*	*65*
082.	Wisconsin, University of-Milwaukee	17	10	14	.30	NA	.90	.50
	Political Science	*44*	*41*	*42*	*51*		*67*	*67*
083.	Yale University	32	68	103	.50	7.9	.82	.50
	Political Science	*61*	*62*	*62*	*65*	*53*	*61*	*67*

* indicates program was initiated since 1970.

NOTE: On the first line of data for every program, raw values for each measure are reported; on the second line values are reported in standardized form, with mean = 50 and standard deviation = 10. "NA" indicates that the value for a measure is not available.

TABLE 7.1 Program Measures (Raw and Standardized Values) in Political Science

Prog No.	Survey Results				University Library	Research Support		Published Articles		Survey Ratings Standard Error			
	(08)	(09)	(10)	(11)	(12)	(13)	(14)	(17)	(18)	(08)	(09)	(10)	(11)
081.	4.1	2.4	1.0	1.7	1.6	.11	344	110	.72	.07	.06	.07	.05
	66	*66*	*49*	*68*	*63*	*57*	*48*	*75*	*57*				
082.	2.2	1.3	1.4	0.9	NA	.24	592	37	.77	.11	.10	.08	.08
	46	*48*	*67*	*47*		*74*	*51*	*48*	*59*				
083.	4.8	2.7	1.0	1.8	2.1	.16	80	96	.84	.05	.06	.07	.04
	72	*72*	*45*	*70*	*69*	*63*	*45*	*70*	*65*				

NOTE: On the first line of data for every program, raw values for each measure are reported; on the second line values are reported in standardized form, with mean = 50 and standard deviation = 10. "NA" indicates that the value for a measure is not available.

TABLE 7.2 Summary Statistics Describing Each Program Measure--Political Science

Measure	Number of Programs Evaluated	Mean	Standard Deviation	DECILES								
				1	2	3	4	5	6	7	8	9
Program Size												
01 Raw Value	83	23	9	12	16	18	19	22	23	25	28	35
Std Value	83	50	10	38	42	45	46	49	50	53	56	64
02 Raw Value	82	35	28	13	16	18	22	25	31	39	48	68
Std Value	82	50	10	42	43	44	45	46	48	51	55	62
03 Raw Value	83	50	43	15	20	26	32	40	47	60	66	101
Std Value	83	50	10	42	43	44	46	48	49	52	54	62
Program Graduates												
04 Raw Value	78	.28	.15	.09	.13	.16	.20	.26	.31	.39	.42	.48
Std Value	78	50	10	37	40	42	45	49	52	57	59	63
05 Raw Value	77	8.3	1.4	10.2	9.5	9.1	8.5	8.2	7.9	7.6	7.3	6.5
Std Value	77	50	10	36	41	44	49	51	53	55	58	63
06 Raw Value	78	.68	.13	.50	.57	.60	.67	.70	.73	.76	.78	.82
Std Value	78	50	10	36	42	44	49	52	54	56	58	61
07 Raw Value	78	.26	.15	.08	.10	.17	.20	.22	.30	.36	.40	.46
Std Value	78	50	10	38	39	44	46	47	53	57	59	63
Survey Results												
08 Raw Value	83	2.6	1.0	1.3	1.7	2.0	2.2	2.6	2.8	3.0	3.4	3.8
Std Value	83	50	10	37	41	44	46	50	52	54	58	62
09 Raw Value	83	1.5	.6	.8	1.0	1.1	1.3	1.4	1.6	1.7	2.0	2.3
Std Value	83	50	10	38	41	43	47	49	52	54	60	65
10 Raw Value	83	1.1	.2	.8	.9	1.0	1.0	1.0	1.1	1.1	1.2	1.3
Std Value	83	50	10	38	43	47	47	47	52	52	56	61
11 Raw Value	83	1.0	.4	.5	.6	.7	.9	1.0	1.1	1.2	1.3	1.6
Std Value	83	50	10	38	40	43	48	50	53	55	58	65
University Library												
12 Raw Value	71	.2	1.0	-.9	-.6	-.4	-.3	.0	.3	.7	.9	1.7
Std Value	71	50	10	38	42	44	45	48	51	55	57	65
Research Support												
13 Raw Value	80	.06	.07	.00	.00	.00	.03	.05	.07	.10	.11	.15
Std Value	80	50	10	41	41	41	46	49	51	56	57	63
14 Raw Value	58	520	848	21	57	88	182	251	378	467	602	1245
Std Value	58	50	10	44	45	45	46	47	48	49	51	59
Publication Records												
17 Raw Value	83	43	27	14	20	24	31	38	49	54	61	77
Std Value	83	50	10	39	41	43	45	48	52	54	57	63
18 Raw Value	80	.63	.15	.44	.48	.54	.58	.61	.66	.72	.77	.81
Std Value	80	50	10	37	40	44	47	49	52	56	59	62

NOTE: Standardized values reported in the preceding table have been computed from exact values of the mean and standard deviation and not the rounded values reported here.

TABLE 7.3 Intercorrelations Among Program Measures on 83 Programs in Political Science

	Measure															
	01	02	03	04	05	06	07	08	09	10	11	12	13	14	17	18
Program Size																
01		.56	.51	.25	-.09	.19	.29	.63	.61	.15	.56	.65	.07	.55	.78	.13
02			.82	.23	.03	.06	.20	.60	.56	-.04	.58	.66	.24	.43	.50	.18
03				.20	-.12	.08	.11	.47	.41	-.12	.44	.51	.05	.27	.42	.20
Program Graduates																
04					-.06	.32	.32	.64	.64	-.01	.62	.44	.25	.32	.34	.24
05						.05	.34	.10	.15	.19	.11	-.05	.17	-.12	-.04	-.01
06							.59	.30	.34	.19	.27	.25	.28	.11	.29	.25
07								.52	.57	.22	.50	.40	.39	.20	.46	.28
Survey Results																
08									.98	.13	.98	.74	.40	.43	.71	.44
09										.15	.97	.69	.43	.39	.70	.44
10											.11	.11	.17	-.06	.17	.14
11												.70	.41	.41	.69	.45
University Library																
12													.18	.40	.71	.37
Research Support																
13														.35	.26	.23
14															.59	.04
Publication Records																
17																.59
18																

NOTE: Since in computing correlation coefficients program data must be available for both of the measures being correlated, the actual number of programs on which each coefficient is based varies.

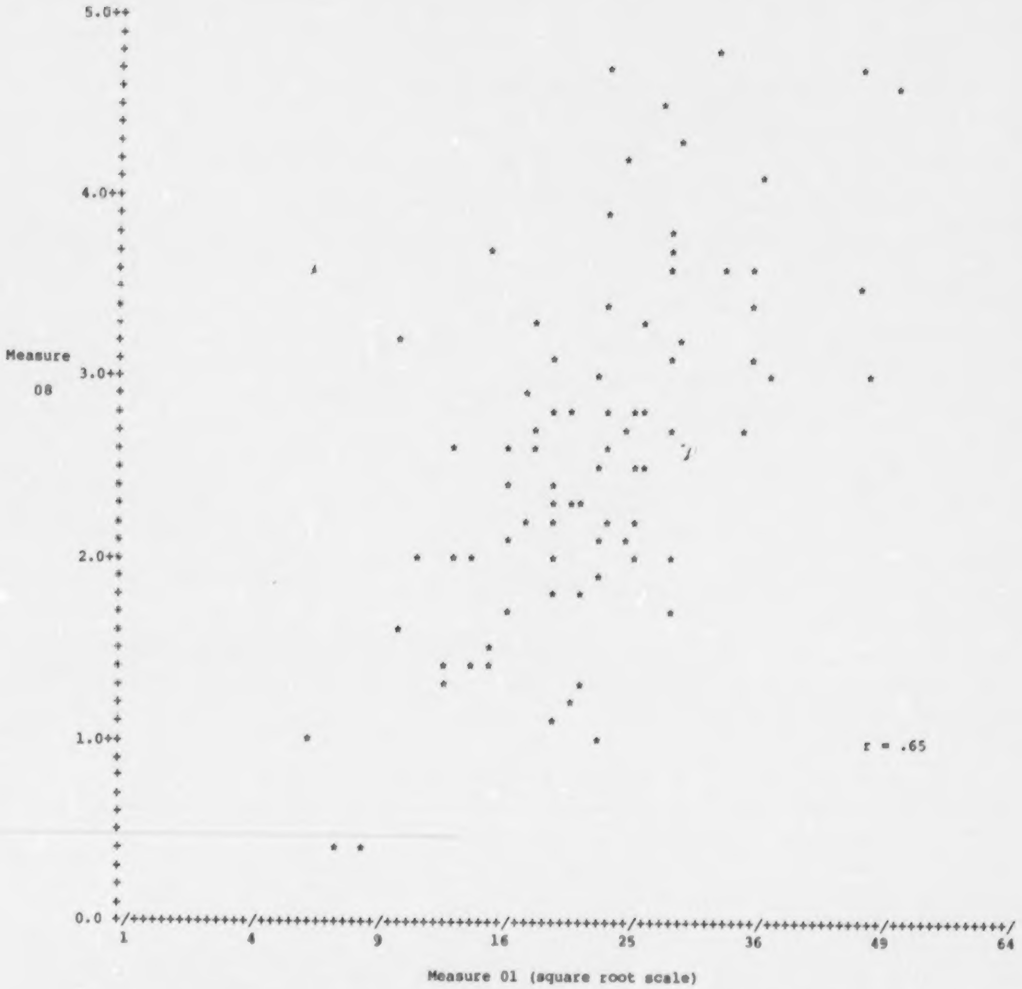

FIGURE 7.1 Mean rating of scholarly quality of faculty (measure 08) versus number of faculty members (measure 01)--83 programs in political science.

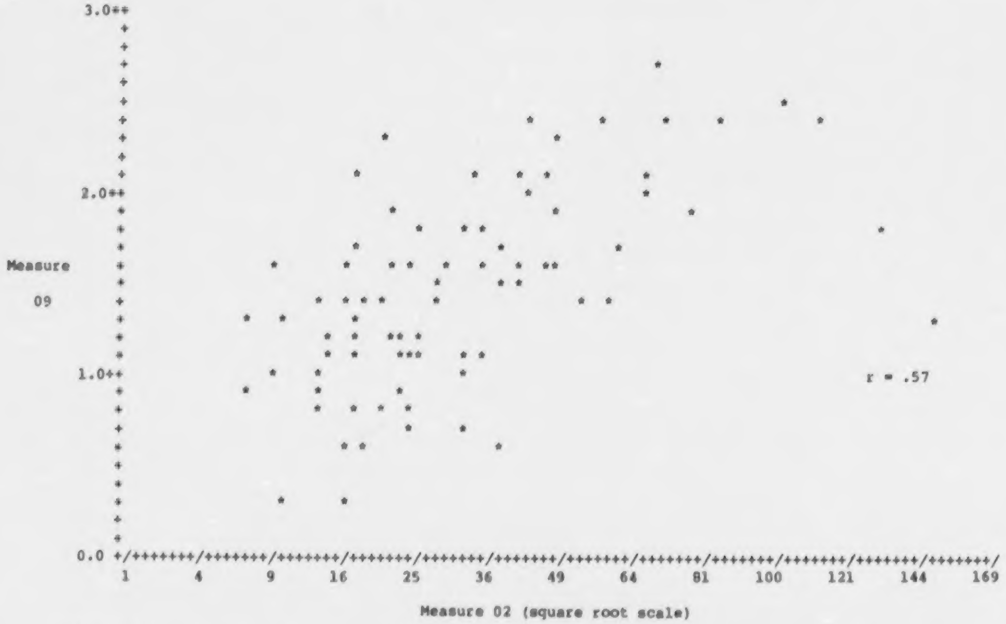

FIGURE 7.2 Mean rating of program effectiveness in educating research scholars/scientists (measure 09) versus number of graduates in last five years (measure 02)--82 programs in political science.

TABLE 7.4 Characteristics of Survey Participants in Political Science

	Respondents	
	N	%
Field of Specialization		
International Relations	16	11
Political Science	117	77
Other/Unknown	19	13
Faculty Rank		
Professor	80	53
Associate Professor	49	32
Assistant Professor	21	14
Other/Unknown	2	1
Year of Highest Degree		
Pre-1950	9	6
1950-59	25	16
1960-69	57	38
Post-1969	60	40
Unknown	1	1
Evaluator Selection		
Nominated by Institution	141	93
Other	11	7
Survey Form		
With Faculty Names	137	90
Without Names	15	10
Total Evaluators	152	100

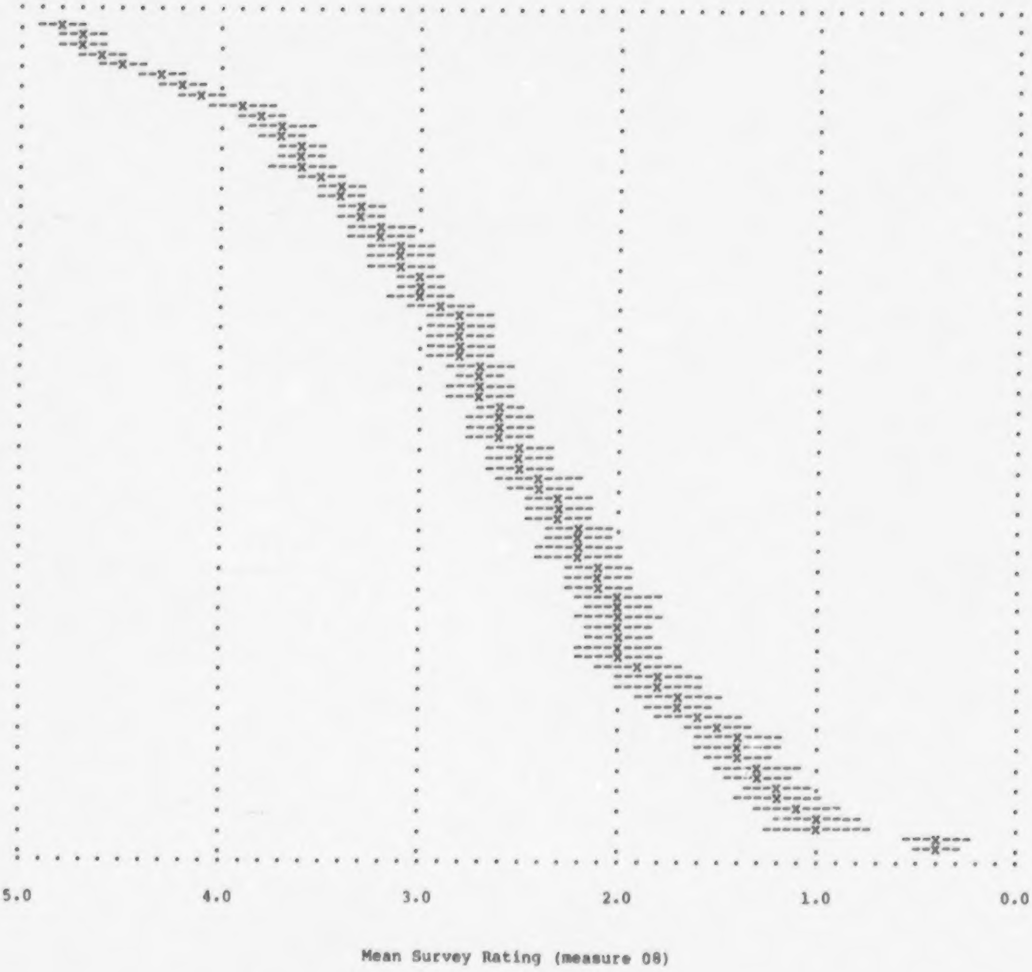

FIGURE 7.3 Mean rating of scholarly quality of faculty in 83 programs in political science.

NOTE: Programs are listed in sequence of mean rating, with the highest-rated progra: appearing at the top of the page. The broken lines (---) indicate a confidence interval of ±1.5 standard errors around the reported mean (x) of each program.

VIII
Psychology Programs

In this chapter 150 research-doctorate programs in psychology are assessed. These programs, according to the information supplied by their universities, have accounted for 10,582 doctoral degrees awarded during the FY1976-80 period--approximately 70 percent of the aggregate number of psychology doctorates earned from U.S. universities in this five-year span.[1] The relatively low percentage of doctorates covered in this discipline may be explained, in part, by the decisions of some study coordinators not to include university programs in clinical psychology, counseling, and/or educational psychology. These three fields account for more than half of the doctoral degrees awarded in psychology in recent years. On the average, 102 full-time and part-time students intending to earn doctorates were enrolled in a program in December 1980, with an average faculty size of 29 members.[2] Five programs were initiated since 1970, and each of two universities--University of California at Irvine and University of Kansas--has two psychology programs included in the assessment. In addition to the 148 institutions represented in this discipline, another 10 were initially identified as meeting the criteria[3] for inclusion in the assessment:

American University
Boston College
University of Nevada--Reno
University of Northern Colorado--Greeley

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[1] Data from the NRC's Survey of Earned Doctorates indicate that a total of 15,066 doctorates in fields of psychology were awarded by U.S. universities between FY1976 and FY1980. Of this total, 5,023 were in clinical psychology, 1,414 in counseling, and 1,417 in educational/school psychology.

[2] See the reported means for measures 03 and 01 in Table 9.2.

[3] As mentioned in Chapter I, the primary criterion for inclusion was that a university had awarded at least 22 doctorates in psychology during the FY1976-78 period.

California School of Professional
  Psychology--Fresno
California School of Professional
  Psychology--Los Angeles
Memphis State University
University of Texas, Health Science
  Center--Dallas
Saint John's University
U.S. International University

The last six institutions chose not to participate in the assessment in any discipline. Psychology programs at the other four institutions have not been included in the evaluations in this discipline, since in each case the study coordinator either indicated that the institution did not at that time have a research-doctorate program in psychology or failed to provide the information requested by the committee. It should be mentioned that the U.S. International University alone accounted for more than 700 doctorates awarded in the FY1976-80 period.

Before examining individual program results presented in Table 8.1, the reader is urged to refer to Chapter II, in which each of the 16 measures[*] used in the assessment is discussed. Summary statistics describing every measure are given in Table 8.2. For all but two of the measures, data are reported for at least 130 of the 150 psychology programs. For measure 12, a composite index of the size of a university library, data are available for 86 programs; for measure 14, the total university expenditures for research in this discipline, data are available for 79 programs. The programs not evaluated on measures 12 and 14 are typically smaller--in terms of faculty size and graduate student enrollment--than other psychology programs. Were data on these two measures available for all 150 programs, it is likely that their reported means would be appreciably lower (and that some of the correlations of these measures with others would be higher).

Intercorrelations among the 16 measures (Pearson product-moment coefficients) are given in Table 8.3. Of particular note are the high positive correlations of the reputational survey ratings (08 and 09) with the fraction of recent graduates employed in Ph.D.-granting universities (measure 07), the university library size (measure 12), and the total number of recently published articles by program faculty (measure 17). Figure 8.1 illustrates the relation between the mean rating of the scholarly quality of faculty (measure 08) and the number of faculty members (measure 01) for each of 150 programs in psychology. Figure 8.2 plots the mean rating of program effectiveness (measure 09) against the total number of FY1976-80 program graduates (measure 02). Although in both figures there is a significant positive correlation between program size and reputational rating, it is quite apparent that some of the smaller programs received high mean ratings.

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[*] In psychology, data are also available on measure 15, the number of published (1978-79) articles attributed to a program, and measure 16, the estimated "overall influence" of these articles. These measures are reported in Appendix J and differ markedly from measures 17 and 18 reported here. For a discussion of measures 15 and 16, see the committee's report on the mathematical and physical sciences.

Table 8.4 describes the 280 faculty members who participated in the evaluation of psychology programs. These individuals constituted 62 percent of those asked to respond to the survey in this discipline and 7 percent of the faculty population in the 150 research-doctorate programs being evaluated.[5] More than three-fourths of the survey participants were in nonclinical areas of psychology, with the largest numbers in experimental and social psychology. A majority of the survey participants had earned their highest degree prior to 1970, and approximately half held the rank of full professor.

To assist the reader in interpreting results of the survey evaluations, estimated standard errors have been computed for mean ratings of the scholarly quality of faculty in 150 psychology programs (and are given in Table 8.1). For each program the mean rating and an associated "confidence interval" of 1.5 standard errors are illustrated in Figure 8.3 (listed in order of highest to lowest mean rating). In comparing two programs, if their confidence intervals do not overlap, one may conclude that there is a significant difference in their mean ratings at a .05 level of significance.[6] From this figure it is also apparent that one should have somewhat more confidence in the accuracy of the mean ratings of higher-rated programs than lower-rated programs. This generalization results primarily from the fact that evaluators are not as likely to be familiar with the less prestigious programs, and consequently the mean ratings of these programs are usually based on fewer survey responses.

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[5] See Table 2.3 in Chapter II.

[6] See pp. 30-32 for a discussion of the interpretation of mean ratings and associated confidence intervals.

TABLE 8.1 Program Measures (Raw and Standardized Values) in Psychology

Prog No.	University - Department/Academic Unit	Program Size			Characteristics of Program Graduates			
		(01)	(02)	(03)	(04)	(05)	(06)	(07)
001.	Adelphi University	13	19	43	.16	5.8	.52	.13
	Psychology	*41*	*39*	*42*	*40*	*55*	*33*	*42*
002.	Alabama, University of-Tuscaloosa	23	45	102	.52	5.6	.68	.27
	Experimental and Clinical Psychology	*47*	*45*	*50*	*56*	*56*	*49*	*52*
003.	Arizona State University-Tempe	21	71	86	.39	5.4	.61	.16
	Psychology	*46*	*50*	*48*	*50*	*59*	*42*	*45*
004.	Arizona, University of-Tucson	29	72	89	.67	5.3	.54	.14
	Psychology	*50*	*50*	*48*	*62*	*60*	*35*	*43*
005.	Arkansas, University-Fayetteville	20	38	41	.32	7.1	.68	.11
	Psychology	*45*	*43*	*42*	*47*	*40*	*48*	*41*
006.	Auburn University	33	50	70	.07	5.3	.88	.16
	Psychology	*52*	*46*	*46*	*36*	*60*	*68*	*45*
007.	Baylor University-Waco	8	NA	8	.03	5.4	.55	.13
	*Psychology**	*39*		*37*	*35*	*58*	*36*	*42*
008.	Boston University	38	111	189	.66	8.0	.65	.09
	Psychology	*55*	*58*	*62*	*62*	*30*	*46*	*40*
009.	Bowling Green State University	31	82	89	.30	5.4	.76	.21
	Psychology	*51*	*52*	*48*	*46*	*58*	*56*	*48*
010.	Brandeis University	14	14	18	.33	7.1	.87	.40
	Psychology	*42*	*38*	*38*	*48*	*40*	*67*	*62*
011.	Brigham Young University	18	44	75	.09	5.3	.82	.18
	Psychology	*44*	*44*	*46*	*37*	*59*	*62*	*46*
012.	Brown University	16	28	26	.52	5.2	.85	.70
	Psychology	*43*	*41*	*40*	*56*	*61*	*65*	*84*
013.	Bryn Mawr College	7	11	10	NA	NA	NA	NA
	Psychology	*38*	*37*	*37*				
014.	CUNY-Graduate School	158	233	509	.22	7.8	.58	.16
	Psychology	*99*	*84*	*99*	*43*	*33*	*39*	*45*
015.	California Schl of Prof Psychology-Berkeley	21	225	242	.14	6.5	.74	.12
	*Psychology**	*46*	*82*	*69*	*39*	*47*	*54*	*41*
016.	California Schl of Prof Psychology-San Diego	17	213	266	.02	5.1	.78	.07
	*Psychology**	*44*	*80*	*73*	*34*	*62*	*59*	*38*
017.	California, University of-Berkeley	40	104	124	.64	7.4	.70	.28
	Psychology	*56*	*57*	*53*	*60*	*37*	*51*	*53*
018.	California, University of-Davis	22	19	30	.23	5.4	.77	.39
	Psychology	*46*	*39*	*40*	*43*	*58*	*57*	*61*
019.	California, University of-Irvine	20	41	39	.16	6.0	.57	.19
	Cognitive Sci/Social Relations (Social Sci)	*45*	*44*	*41*	*40*	*52*	*38*	*47*
020.	California, University of-Irvine	15	29	30	.95	4.6	.86	.67
	Psychobiology (Schl of Biological Science)	*43*	*41*	*40*	*74*	*67*	*66*	*82*

* indicates program was initiated since 1970.

NOTE: On the first line of data for every program, raw values for each measure are reported; on the second line values are reported in standardized form, with mean = 50 and standard deviation = 10. "NA" indicates that the value for a measure is not available.

TABLE 8.1 Program Measures (Raw and Standardized Values) in Psychology

Prog No.	Survey Results				University Library	Research Support		Published Articles		Survey Ratings Standard Error			
	(08)	(09)	(10)	(11)	(12)	(13)	(14)	(17)	(18)	(08)	(09)	(10)	(11)
001.	1.2	0.8	0.7	0.3	NA	.08	NA	14	.39	.12	.11	.14	.05
	37	*33*	*35*	*40*		*43*		*39*	*33*				
002.	2.4	1.5	1.1	0.5	-1.3	.00	NA	28	.52	.18	.15	.10	.07
	48	*48*	*51*	*44*	*36*	*38*		*42*	*42*				
003.	2.6	1.6	1.1	0.8	-0.3	.24	457	91	.95	.10	.08	.11	.07
	51	*50*	*49*	*52*	*46*	*52*	*45*	*52*	*68*				
004.	2.3	1.4	1.3	0.6	0.9	.03	NA	61	.66	.11	.11	.15	.07
	48	*47*	*58*	*47*	*58*	*40*		*47*	*50*				
005.	1.4	1.0	0.8	0.2	NA	.00	NA	45	.50	.12	.16	.11	.04
	38	*38*	*36*	*38*		*38*		*44*	*40*				
006.	1.7	0.9	1.6	0.3	NA	.00	NA	122	.67	.17	.23	.15	.06
	41	*37*	*71*	*40*		*38*		*57*	*50*				
007.	1.1	0.8	1.0	0.2	NA	NA	NA	2	NA	.17	.15	.16	.05
	35	*33*	*44*	*38*				*37*					
008.	2.9	1.7	1.3	0.7	-0.4	.13	NA	68	.68	.11	.08	.09	.06
	53	*52*	*58*	*49*	*46*	*46*		*48*	*51*				
009.	2.4	1.7	1.1	0.6	NA	.19	500	90	.74	.10	.08	.10	.06
	49	*53*	*49*	*48*		*49*	*45*	*51*	*55*				
010.	2.6	1.5	0.9	0.7	NA	.43	253	33	.64	.12	.10	.13	.06
	50	*48*	*42*	*49*		*63*	*43*	*42*	*49*				
011.	1.6	NA	NA	0.2	-0.6	.11	NA	34	.61	.16	NA	NA	.04
	40			*38*	*43*	*45*		*43*	*47*				
012.	3.6	2.2	0.9	1.0	-1.1	.63	449	49	.75	.13	.09	.10	.08
	61	*62*	*40*	*56*	*39*	*74*	*45*	*45*	*55*				
013.	1.9	1.5	0.9	0.4	NA	NA	NA	26	NA	.23	.20	.11	.08
	43	*48*	*41*	*44*				*41*					
014.	3.6	2.0	0.8	1.1	NA	.13	342	186	.42	.10	.07	.11	.07
	61	*58*	*39*	*59*		*46*	*44*	*67*	*35*				
015.	1.0	0.5	1.2	0.3	NA	.00	NA	4	.19	.20	.13	.12	.05
	35	*28*	*55*	*40*		*38*		*38*	*21*				
016.	0.7	0.2	1.2	0.3	NA	.00	NA	5	.24	.18	.10	.09	.05
	31	*22*	*54*	*39*		*38*		*38*	*24*				
017.	4.4	2.3	0.9	1.6	2.2	.53	2204	130	.83	.08	.08	.07	.06
	69	*65*	*40*	*71*	*71*	*69*	*61*	*58*	*60*				
018.	2.3	1.5	0.9	0.5	0.6	.23	NA	92	.86	.11	.10	.16	.05
	48	*48*	*44*	*45*	*56*	*51*		*52*	*62*				
019.	2.7	1.5	1.1	0.4	NA	.15	NA	22	.40	.18	.13	.17	.07
	51	*48*	*49*	*44*		*47*		*41*	*34*				
020.	3.1	1.9	1.2	0.5	NA	.67	NA	27	.53	.15	.10	.16	.06
	55	*57*	*55*	*44*		*77*		*41*	*42*				

NOTE: On the first line of data for every program, raw values for each measure are reported; on the second line values are reported in standardized form, with mean = 50 and standard deviation = 10. "NA" indicates that the value for a measure is not available.

TABLE 8.1 Program Measures (Raw and Standardized Values) in Psychology

Prog No.	University - Department/Academic Unit	Program Size			Characteristics of Program Graduates			
		(01)	(02)	(03)	(04)	(05)	(06)	(07)
021.	California, University of-Los Angeles	68	138	189	.68	6.3	.70	.36
	Psychology	*71*	*64*	*62*	*62*	*49*	*51*	*59*
022.	California, University of-Riverside	14	28	47	.59	6.1	.62	.35
	Psychology	*42*	*41*	*42*	*58*	*51*	*43*	*59*
023.	California, University of-San Diego	22	56	35	.66	5.8	.83	.44
	Psychology	*46*	*47*	*41*	*62*	*54*	*63*	*65*
024.	California, University of-Santa Barbara	25	40	54	.53	6.4	.70	.40
	Psychology	*48*	*43*	*43*	*56*	*48*	*51*	*62*
025.	Carnegie-Mellon University	17	16	15	.81	6.3	.88	.47
	Psychology and Education	*44*	*38*	*38*	*68*	*49*	*68*	*67*
026.	Case Western Reserve University	13	51	10	.65	5.8	.73	.18
	Clinical Psychology	*41*	*46*	*37*	*61*	*54*	*53*	*46*
027.	Catholic University of America	19	116	163	.27	8.3	.66	.05
	Psychology	*45*	*59*	*58*	*45*	*27*	*47*	*36*
028.	Chicago, University of	60	57	217	.65	7.4	.77	.45
	Behavioral Sciences	*67*	*47*	*66*	*61*	*37*	*58*	*66*
029.	Cincinnati, University of	39	76	131	.45	6.1	.65	.24
	Psychology	*56*	*51*	*54*	*53*	*51*	*46*	*50*
030.	Claremont Graduate School	21	37	112	.70	9.8	.64	.23
	Psychology	*46*	*43*	*51*	*63*	*11*	*45*	*49*
031.	Clark University	16	18	37	.87	7.8	.93	.33
	Psychology	*43*	*39*	*41*	*70*	*33*	*73*	*57*
032.	Colorado State University-Fort Collins	29	50	64	.04	6.8	.67	.18
	Psychology	*50*	*46*	*45*	*35*	*44*	*48*	*46*
033.	Colorado, University of	45	123	155	.75	6.3	.60	.26
	Psychology	*59*	*61*	*57*	*65*	*48*	*41*	*52*
034.	Columbia Teachers College	37	222	300	.43	8.4	.59	.13
	Psychology	*55*	*82*	*77*	*52*	*26*	*40*	*42*
035.	Columbia University	18	41	37	.37	6.6	.79	.33
	Psychology	*44*	*44*	*41*	*49*	*45*	*58*	*57*
036.	Connecticut, University of-Storrs	44	90	119	.62	6.2	.73	.31
	Psychology	*58*	*54*	*52*	*60*	*50*	*54*	*55*
037.	Cornell University-Ithaca	34	56	38	.60	6.2	.77	.35
	Psychology	*53*	*47*	*41*	*59*	*50*	*57*	*58*
038.	Delaware, University of-Newark	20	45	61	.26	6.5	.62	.13
	Psychology	*45*	*45*	*44*	*45*	*47*	*43*	*42*
039.	Denver, University of	30	45	84	.65	6.9	.56	.15
	Psychology	*51*	*45*	*48*	*61*	*42*	*38*	*43*
040.	DePaul University	18	34	65	.19	6.4	.82	.11
	Psychology	*44*	*42*	*45*	*41*	*47*	*62*	*41*

* indicates program was initiated since 1970.

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TABLE 8.1 Program Measures (Raw and Standardized Values) in Psychology

Prog No.	Survey Results				University Library	Research Support		Published Articles		Survey Ratings Standard Error			
	(08)	(09)	(10)	(11)	(12)	(13)	(14)	(17)	(18)	(08)	(09)	(10)	(11)
021.	4.3	2.3	1.3	1.5	2.0	.44	2766	319	.82	.07	.07	.07	.06
	68	65	57	69	69	64	66	88	60				
022.	2.1	1.4	0.8	0.5	-1.0	.29	224	65	.79	.14	.14	.14	.07
	46	46	39	45	39	55	43	47	58				
023.	4.2	2.3	1.4	1.4	-0.0	.59	693	79	.77	.09	.07	.08	.07
	66	63	64	65	49	72	47	50	57				
024.	3.3	1.9	1.1	1.0	-0.1	.48	480	91	.72	.09	.08	.10	.07
	57	57	51	57	48	66	45	52	54				
025.	4.0	2.3	1.6	1.2	NA	.35	847	79	.82	.09	.07	.07	.07
	65	65	72	62		59	49	50	60				
026.	1.7	1.2	0.4	0.3	-1.3	.08	397	19	.46	.17	.16	.16	.05
	41	43	22	40	36	43	44	40	38				
027.	2.2	1.4	1.1	0.5	NA	.11	NA	28	.79	.15	.14	.10	.07
	46	47	52	44		44		42	58				
028.	4.2	2.2	1.1	1.4	0.9	.40	1114	187	.82	.08	.07	.09	.07
	67	62	51	66	58	61	51	67	60				
029.	2.3	1.5	0.9	0.6	-0.2	.00	NA	84	.62	.12	.09	.09	.07
	48	47	40	49	47	38		51	47				
030.	2.4	1.4	1.3	0.5	NA	.29	NA	54	.81	.14	.13	.10	.06
	49	46	60	46		55		46	59				
031.	2.4	1.6	0.9	0.7	NA	.19	NA	32	.75	.12	.09	.09	.07
	49	51	42	50		49		42	55				
032.	1.8	1.2	1.1	0.3	-1.1	.17	NA	96	.83	.13	.10	.11	.05
	42	42	49	41	38	48		52	60				
033.	3.9	2.2	1.3	1.4	-0.9	.31	2197	203	.76	.08	.06	.09	.07
	64	63	60	66	41	56	61	69	56				
034.	3.0	1.7	0.7	0.8	NA	.08	240	50	.54	.11	.10	.10	.07
	54	52	36	53		43	43	45	43				
035.	4.0	2.2	0.7	1.3	1.7	.44	365	55	.83	.10	.06	.09	.08
	64	62	32	65	67	64	44	46	61				
036.	3.4	2.0	1.2	1.1	-0.5	.21	2886	120	.73	.08	.06	.09	.07
	58	50	55	60	44	50	68	56	54				
037.	3.9	2.1	1.3	1.3	1.6	.29	2155	72	.71	.09	.06	.10	.07
	63	61	58	65	66	55	61	49	53				
038.	2.0	1.3	1.3	0.5	NA	.25	NA	49	.50	.13	.12	.11	.06
	45	44	57	45		53		45	40				
039.	3.0	1.8	1.4	0.9	NA	.37	704	73	.73	.12	.09	.09	.08
	54	53	65	54		59	47	49	54				
040.	1.1	0.8	NA	0.2	NA	.00	NA	35	.56	.14	.17	NA	.04
	36	34		38		38		43	44				

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TABLE 8.1 Program Measures (Raw and Standardized Values) in Psychology

Prog No.	University - Department/Academic Unit	Program Size (01)	(02)	(03)	Characteristics of Program Graduates (04)	(05)	(06)	(07)
041.	Detroit, University of	11	27	50	.07	5.8	.93	.00
	Psychology	*40*	*41*	*43*	*36*	*55*	*73*	*33*
042.	Duke University	33	64	81	.94	5.9	.63	.39
	Psychology	*52*	*49*	*47*	*74*	*53*	*44*	*61*
043.	Emory University	20	46	60	.67	5.6	.60	.24
	Psychology	*45*	*45*	*44*	*62*	*56*	*41*	*51*
044.	Florida State University-Tallahassee	29	112	149	.64	5.5	.71	.24
	Psychology	*50*	*59*	*56*	*61*	*58*	*52*	*50*
045.	Florida, University of-Gainesville	41	126	178	.57	5.7	.63	.27
	Psychology	*57*	*62*	*60*	*58*	*56*	*44*	*53*
046.	Fordham University	30	76	139	.25	7.5	.69	.09
	Psychology	*51*	*51*	*55*	*44*	*36*	*50*	*39*
047.	Fuller Theological Seminary-Pasadena	14	57	150	.10	8.5	.67	.08
	Psychology	*42*	*47*	*57*	*38*	*25*	*48*	*38*
048.	George Washington University	19	61	142	.43	7.2	.70	.07
	Psychology	*45*	*48*	*55*	*52*	*39*	*50*	*38*
049.	Georgia State University-Atlanta	29	80	152	.06	7.1	.53	.11
	Psychology	*50*	*52*	*57*	*36*	*40*	*34*	*41*
050.	Georgia, University of-Athens	38	167	200	.28	5.4	.73	.20
	Psychology	*55*	*70*	*63*	*45*	*59*	*53*	*47*
051.	Harvard University	27	113	82	.62	5.8	.71	.51
	Psychology and Social Relations	*49*	*59*	*47*	*60*	*54*	*52*	*70*
052.	Hawaii, University of	25	66	NA	.24	7.0	.49	.13
	Psychology	*48*	*49*		*43*	*41*	*31*	*42*
053.	Hofstra University	7	32	75	.00	6.1	.73	.07
	*Psychology**	*38*	*42*	*46*	*33*	*51*	*54*	*38*
054.	Houston, University of	32	122	146	.51	6.5	.65	.21
	Psychology	*52*	*61*	*56*	*55*	*47*	*46*	*48*
055.	Illinois Institute of Technology	17	86	197	.02	7.0	.57	.06
	Psychology	*44*	*53*	*63*	*34*	*41*	*38*	*37*
056.	Illinois, University of-Chicago Circle	35	29	108	.13	6.0	.71	.18
	Psychology	*53*	*41*	*51*	*39*	*52*	*52*	*46*
057.	Illinois, University-Urbana/Champaign	56	116	145	.56	6.3	.80	.41
	Psychology	*65*	*59*	*56*	*57*	*48*	*61*	*63*
058.	Indiana University-Bloomington	40	79	109	.42	5.6	.88	.43
	Psychology	*56*	*52*	*51*	*51*	*56*	*68*	*64*
059.	Iowa State University-Ames	31	47	50	.23	5.1	.75	.23
	Psychology	*51*	*45*	*43*	*43*	*61*	*56*	*49*
060.	Iowa, University of-Iowa City	32	54	56	.49	5.7	.66	.41
	Psychology	*52*	*46*	*44*	*54*	*55*	*47*	*63*

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TABLE 8.1 Program Measures (Raw and Standardized Values) in Psychology

Prog No.	Survey Results				University Library	Research Support		Published Articles		Survey Ratings Standard Error			
	(08)	(09)	(10)	(11)	(12)	(13)	(14)	(17)	(18)	(08)	(09)	(10)	(11)
041.	0.8	NA	NA	0.1	NA	.00	NA	9	.27	.15	NA	NA	.03
	33			35		38		39	26				
042.	3.7	2.1	0.9	1.2	0.3	.36	359	75	.70	.09	.06	.10	.07
	61	60	44	61	53	59	44	49	52				
043.	2.3	1.5	0.8	0.6	-0.6	.25	183	61	.60	.12	.11	.14	.07
	48	49	39	48	43	53	42	47	46				
044.	2.8	1.7	1.0	0.9	-0.4	.35	1362	65	.69	.11	.09	.11	.08
	53	53	48	55	45	58	53	47	52				
045.	2.9	1.8	1.1	1.0	0.8	.24	809	155	.76	.09	.08	.10	.07
	54	54	49	56	57	52	48	62	56				
046.	1.7	1.0	NA	0.2	NA	.00	NA	17	.17	.16	.17	NA	.05
	42	38		39		38		40	20				
047.	1.4	0.8	NA	0.2	NA	.00	NA	11	.43	.19	.17	NA	.05
	39	34		38		38		39	36				
048.	1.8	1.1	NA	0.2	NA	.11	NA	21	.37	.16	.11	NA	.05
	42	41		39		44		40	32				
049.	2.0	1.3	1.4	0.5	NA	.07	230	91	.59	.13	.13	.12	.06
	45	44	61	44		42	43	52	45				
050.	2.7	1.7	1.4	0.8	0.4	.13	927	196	.84	.10	.09	.09	.07
	52	53	62	53	54	46	49	68	61				
051.	4.6	2.3	0.9	1.6	3.0	.52	1664	173	.85	.07	.08	.10	.06
	70	64	41	72	79	68	56	65	62				
052.	2.6	1.5	1.0	0.7	-0.1	.24	NA	74	.76	.11	.11	.12	.07
	50	47	47	51	48	52		49	56				
053.	0.7	0.5	NA	0.2	NA	NA	NA	11	NA	.14	.15	NA	.04
	31	29		38				39					
054.	2.9	1.6	1.6	0.9	-0.9	.19	743	79	.69	.10	.08	.09	.06
	54	51	71	55	40	49	48	50	52				
055.	1.3	0.7	NA	0.2	NA	.00	265	31	.71	.15	.14	NA	.05
	37	33		39		38	43	42	53				
056.	2.9	1.6	1.4	0.9	NA	.17	215	122	.80	.10	.07	.10	.07
	53	51	62	55		48	43	57	58				
057.	4.2	2.5	1.1	1.5	2.0	.32	1948	208	.73	.08	.06	.08	.06
	67	67	51	69	69	57	59	70	54				
058.	3.9	2.3	1.1	1.2	0.9	.50	992	104	.70	.09	.07	.09	.07
	63	64	50	62	59	67	50	54	52				
059.	2.1	1.3	0.8	0.3	-0.5	.10	354	101	.71	.16	.16	.14	.06
	45	45	37	41	44	44	44	53	53				
060.	3.3	2.0	0.7	1.1	0.3	.19	530	120	.69	.10	.08	.11	.07
	58	59	36	59	52	49	46	56	52				

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TABLE 8.1 Program Measures (Raw and Standardized Values) in Psychology

Prog No.	University - Department/Academic Unit	Program Size			Characteristics of Program Graduates			
		(01)	(02)	(03)	(04)	(05)	(06)	(07)
061.	Johns Hopkins University	15	45	48	.76	4.3	.73	.41
	Psychology	*43*	*45*	*43*	*66*	*70*	*54*	*62*
062.	Kansas State University-Manhattan	17	29	24	.45	5.1	.58	.23
	Psychology	*44*	*41*	*39*	*53*	*62*	*39*	*49*
063.	Kansas, University of	42	79	136	.41	6.1	.72	.38
	Human Development and Family Life	*57*	*52*	*55*	*51*	*51*	*52*	*60*
064.	Kansas, University of	44	114	116	.53	6.0	.72	.22
	Psychology	*58*	*59*	*52*	*56*	*52*	*53*	*49*
065.	Kent State University	30	76	120	.22	5.8	.87	.19
	Psychology	*51*	*51*	*52*	*43*	*54*	*67*	*47*
066.	Kentucky, University of	21	46	84	.28	7.0	.77	.19
	Psychology	*46*	*45*	*48*	*45*	*41*	*57*	*46*
067.	Long Island University-Brooklyn Center	10	65	95	.00	6.7	.57	.02
	Psychology	*40*	*49*	*49*	*33*	*45*	*38*	*34*
068.	Louisiana State University-Baton Rouge	18	62	73	.39	6.0	.49	.12
	Psychology	*44*	*48*	*46*	*50*	*52*	*31*	*41*
069.	Louisville, University of	22	43	72	.29	6.0	.74	.24
	Psychology	*46*	*44*	*46*	*46*	*52*	*54*	*50*
070.	Loyola University of Chicago	37	60	130	.25	6.2	.78	.19
	Psychology	*55*	*48*	*54*	*44*	*50*	*58*	*47*
071.	Maryland, University of-College Park	41	98	172	.41	5.4	.74	.16
	Psychology	*57*	*56*	*60*	*51*	*59*	*54*	*45*
072.	Massachusetts Institute of Technology	15	25	31	.80	4.6	.84	.52
	Psychology	*43*	*40*	*40*	*67*	*67*	*64*	*71*
073.	Massachusetts, University of-Amherst	54	133	162	.50	6.2	.70	.27
	Psychology	*64*	*63*	*58*	*55*	*50*	*50*	*52*
074.	Miami University-Ohio	23	52	25	.33	6.9	.82	.13
	Psychology	*47*	*46*	*39*	*48*	*42*	*62*	*42*
075.	Miami, University of-Florida	19	67	69	.45	6.0	.55	.22
	Psychology	*45*	*49*	*45*	*53*	*52*	*37*	*49*
076.	Michigan State University-East Lansing	55	137	175	.57	6.3	.70	.30
	Psychology	*64*	*64*	*60*	*57*	*49*	*51*	*54*
077.	Michigan, University of-Ann Arbor	111	222	259	.64	6.4	.69	.39
	Psychology	*95*	*82*	*72*	*61*	*48*	*50*	*61*
078.	Minnesota, University of	58	162	222	.46	6.9	.72	.29
	Psychology	*66*	*69*	*66*	*53*	*43*	*53*	*54*
079.	Mississippi, University of-Oxford	11	33	65	.17	5.8	.76	.21
	Psychology	*40*	*42*	*45*	*41*	*54*	*56*	*48*
080.	Missouri, University of-Columbia	26	63	58	.39	6.6	.52	.19
	Psychology	*49*	*48*	*44*	*50*	*45*	*33*	*47*

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TABLE 8.1 Program Measures (Raw and Standardized Values) in Psychology

Prog No.	Survey Results				University Library	Research Support		Published Articles		Survey Ratings Standard Error			
	(08)	(09)	(10)	(11)	(12)	(13)	(14)	(17)	(18)	(08)	(09)	(10)	(11)
061.	3.8	2.1	0.7	1.1	-0.4	.53	642	66	.87	.10	.06	.09	.07
	62	*60*	*35*	*60*	*45*	*69*	*47*	*48*	*63*				
062.	2.5	1.5	0.8	0.5	NA	.18	NA	63	.82	.13	.11	.12	.08
	50	*48*	*40*	*46*		*48*		*47*	*60*				
063.	3.1	1.9	1.0	0.6	0.1	.14	3904	114	.71	.18	.12	.07	.08
	56	*57*	*48*	*47*	*50*	*46*	*77*	*55*	*53*				
064.	3.4	2.0	1.3	1.1	0.1	.09	3904	165	.80	.10	.07	.10	.07
	58	*59*	*59*	*60*	*50*	*43*	*77*	*63*	*58*				
065.	2.3	1.5	1.0	0.5	-1.8	.20	NA	87	.67	.15	.11	.08	.06
	46	*48*	*47*	*45*	*32*	*50*		*51*	*50*				
066.	1.9	1.2	1.0	0.4	-0.1	.14	NA	39	.48	.13	.11	.14	.06
	43	*43*	*48*	*43*	*49*	*46*		*43*	*39*				
067.	1.3	0.6	NA	0.3	NA	.00	NA	3	.20	.15	.13	NA	.05
	38	*31*		*40*		*38*		*38*	*22*				
068.	1.8	1.0	0.9	0.3	-0.3	.06	224	10	.39	.14	.14	.14	.05
	42	*38*	*44*	*41*	*46*	*41*	*43*	*39*	*33*				
069.	1.9	1.3	1.2	0.4	NA	.14	NA	60	.86	.09	.11	.08	.06
	43	*44*	*55*	*43*		*46*		*47*	*62*				
070.	2.2	1.5	1.2	0.6	NA	.16	238	70	.51	.12	.12	.13	.07
	47	*48*	*53*	*47*		*47*	*43*	*48*	*41*				
071.	2.9	1.8	1.1	0.9	0.2	.12	684	101	.66	.10	.06	.07	.07
	54	*55*	*51*	*56*	*51*	*45*	*47*	*53*	*50*				
072.	3.7	2.3	0.8	0.9	-0.3	.73	1982	39	.87	.12	.11	.09	.08
	62	*63*	*40*	*56*	*46*	*81*	*59*	*43*	*63*				
073.	3.3	1.9	1.3	1.2	-0.7	.35	891	132	.72	.08	.05	.09	.07
	57	*56*	*57*	*61*	*42*	*59*	*49*	*58*	*54*				
074.	2.1	1.4	1.2	0.4	-0.8	.04	NA	59	.78	.11	.11	.14	.06
	45	*46*	*53*	*42*	*42*	*41*		*47*	*57*				
075.	2.3	1.3	1.3	0.5	NA	.05	NA	74	.79	.11	.09	.14	.06
	47	*44*	*57*	*46*		*41*		*49*	*58*				
076.	3.1	1.9	1.0	0.9	0.3	.09	1749	150	.71	.10	.06	.10	.07
	56	*57*	*48*	*55*	*53*	*43*	*57*	*61*	*53*				
077.	4.5	2.5	0.8	1.6	1.8	.32	4714	274	.70	.07	.07	.07	.06
	70	*67*	*37*	*70*	*67*	*57*	*85*	*81*	*53*				
078.	4.3	2.5	1.1	1.6	1.2	.33	3408	221	.74	.08	.06	.07	.06
	68	*69*	*49*	*71*	*61*	*57*	*72*	*72*	*55*				
079.	1.1	0.7	1.2	0.3	NA	.09	NA	21	.55	.14	.12	.15	.05
	36	*32*	*53*	*39*		*43*		*40*	*43*				
080.	2.5	1.6	0.8	0.7	-0.2	.23	395	160	.89	.12	.09	.13	.07
	50	*50*	*39*	*49*	*48*	*52*	*44*	*63*	*64*				

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TABLE 8.1 Program Measures (Raw and Standardized Values) in Psychology

Prog No.	University - Department/Academic Unit	Program Size (01)	(02)	(03)	Characteristics of Program Graduates (04)	(05)	(06)	(07)
081.	Montana, University of-Missoula	16	44	52	.46	6.1	.47	.09
	Psychology	*43*	*44*	*43*	*53*	*51*	*29*	*39*
082.	Nebraska, University of-Lincoln	21	67	67	.58	6.2	.61	.19
	Psychology	*46*	*49*	*45*	*58*	*50*	*42*	*47*
083.	New Hampshire, University of	16	24	36	.04	5.5	.77	.23
	Psychology	*43*	*40*	*41*	*35*	*58*	*57*	*50*
084.	New Mexico, University of-Albuquerque	25	35	63	.42	5.8	.69	.22
	Psychology	*48*	*42*	*45*	*51*	*54*	*50*	*49*
085.	New School for Social Research	17	75	271	.10	8.8	.58	.12
	Psychology	*44*	*51*	*73*	*38*	*21*	*39*	*41*
086.	New York University	38	154	232	.55	8.3	.76	.19
	Psychology	*55*	*67*	*68*	*57*	*27*	*56*	*47*
087.	North Carolina State University-Raleigh	19	44	118	.12	7.8	.76	.15
	Psychology	*45*	*44*	*52*	*39*	*32*	*56*	*43*
088.	North Carolina, University of-Chapel Hill	40	114	122	.77	5.8	.71	.28
	Psychology	*56*	*59*	*53*	*66*	*54*	*52*	*53*
089.	North Carolina, University of-Greensboro	19	40	21	.07	6.2	.74	.19
	*Psychology**	*45*	*43*	*39*	*36*	*50*	*54*	*47*
090.	North Dakota, University of-Grand Forks	15	42	31	.43	5.7	.65	.08
	Psychology	*43*	*44*	*40*	*52*	*55*	*46*	*39*
091.	North Texas State University-Denton	23	45	175	.00	7.8	.58	.15
	*Psychology**	*47*	*45*	*60*	*33*	*33*	*39*	*44*
092.	Northeastern University	16	18	27	.25	6.5	.69	.38
	Psychology	*43*	*39*	*40*	*44*	*47*	*50*	*60*
093.	Northern Illinois University-De Kalb	24	38	100	.07	5.9	.76	.29
	Psychology	*47*	*43*	*50*	*36*	*53*	*57*	*54*
094.	Northwestern University	28	53	53	.54	5.4	.63	.39
	Psychology	*50*	*46*	*43*	*56*	*59*	*44*	*61*
095.	Notre Dame, University of	13	29	69	.23	5.4	.71	.13
	Psychology	*41*	*41*	*45*	*43*	*59*	*52*	*42*
096.	Ohio State University-Columbus	47	271	263	.23	5.6	.68	.22
	Psychology	*60*	*92*	*72*	*43*	*57*	*49*	*49*
097.	Ohio University-Athens	26	65	110	.35	6.5	.83	.10
	Psychology	*49*	*49*	*51*	*48*	*47*	*63*	*40*
098.	Oklahoma State University-Stillwater	23	41	53	.51	5.9	.60	.07
	Psychology	*47*	*44*	*43*	*55*	*53*	*42*	*38*
099.	Oklahoma, University of-Norman	14	23	19	.19	5.1	.48	.19
	Psychology	*42*	*40*	*39*	*41*	*61*	*30*	*47*
100.	Oregon, University of-Eugene	34	65	78	.59	5.4	.76	.35
	Psychology	*53*	*49*	*47*	*58*	*58*	*57*	*58*

* indicates program was initiated since 1970.

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TABLE 8.1 Program Measures (Raw and Standardized Values) in Psychology

Prog	Survey Results				University Library	Research Support		Published Articles		Survey Ratings Standard Error			
No.	(08)	(09)	(10)	(11)	(12)	(13)	(14)	(17)	(18)	(08)	(09)	(10)	(11)
081.	1.4	1.2	1.1	0.2	NA	.06	NA	64	.75	.14	.13	.14	.05
	39	41	52	39		42		47	55				
082.	2.1	1.4	0.9	0.5	-0.5	.14	313	37	.62	.10	.10	.09	.05
	46	46	42	44	44	46	44	43	47				
083.	1.8	1.2	1.4	0.4	NA	.31	NA	39	.63	.18	.16	.16	.06
	43	43	62	42		56		43	48				
084.	2.7	1.7	1.2	0.7	-1.0	.20	NA	50	.52	.12	.10	.10	.07
	51	53	54	50	40	50		45	41				
085.	3.1	1.5	0.8	1.0	NA	.18	215	28	.41	.09	.09	.09	.06
	55	49	40	56		48	43	42	35				
086.	3.3	1.9	1.1	1.0	0.5	.34	643	84	.63	.12	.08	.11	.07
	58	57	52	57	54	58	47	51	48				
087.	1.8	NA	NA	0.3	NA	.05	NA	30	.42	.14	NA	NA	.06
	42			41		41		42	35				
088.	3.7	2.2	1.1	1.2	1.0	.28	369	113	.73	.10	.06	.08	.07
	62	61	51	62	59	54	44	55	54				
089.	2.1	1.6	1.5	0.4	NA	.05	NA	60	.84	.18	.15	.12	.06
	45	49	67	42		41		47	61				
090.	1.2	1.1	NA	0.2	NA	.13	NA	21	.67	.16	.17	NA	.05
	36	41		38		46		40	50				
091.	1.2	0.8	1.3	0.2	NA	.00	NA	58	.65	.19	.17	.21	.05
	37	34	58	39		38		46	49				
092.	2.4	1.5	1.2	0.6	NA	.63	473	31	.63	.13	.16	.11	.08
	48	47	55	49		74	45	42	48				
093.	1.8	1.3	1.1	0.4	NA	.04	NA	46	.58	.13	.11	.11	.06
	43	44	49	43		40		44	45				
094.	3.6	2.2	0.6	1.2	0.3	.36	596	140	.75	.10	.06	.10	.08
	61	62	31	61	52	59	46	59	55				
095.	1.5	1.1	1.0	0.3	-1.3	.15	NA	62	.85	.11	.09	.12	.05
	40	40	47	41	36	47		47	61				
096.	3.4	2.0	0.8	1.2	0.9	.13	469	159	.89	.09	.08	.09	.06
	59	59	37	61	58	45	45	62	64				
097.	2.0	1.3	1.0	0.4	NA	.04	NA	57	.65	.12	.10	.15	.05
	44	44	47	42		40		46	50				
098.	1.5	1.0	NA	0.2	-1.9	.04	NA	24	.57	.16	.22	NA	.04
	39	36		38	30	41		41	44				
099.	1.8	1.4	1.0	0.4	-0.6	.29	358	25	.86	.14	.11	.14	.06
	42	46	44	42	44	55	44	41	62				
100.	3.9	2.3	1.3	1.3	-0.9	.38	870	83	.68	.09	.06	.09	.07
	63	64	57	65	40	60	49	50	51				

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TABLE 8.1 Program Measures (Raw and Standardized Values) in Psychology

Prog No.	University - Department/Academic Unit	Program Size			Characteristics of Program Graduates			
		(01)	(02)	(03)	(04)	(05)	(06)	(07)
101.	Pennsylvania State University	32	69	97	.65	6.3	.77	.32
	Psychology	*52*	*50*	*49*	*61*	*49*	*58*	*56*
102.	Pennsylvania, University of	40	46	52	.73	4.9	.88	.55
	Psychology	*56*	*45*	*43*	*64*	*64*	*68*	*73*
103.	Pittsburgh, University of	44	65	114	.53	6.2	.77	.42
	Psychology	*58*	*49*	*52*	*56*	*50*	*58*	*63*
104.	Princeton University	21	38	40	.28	4.6	.87	.53
	Psychology	*46*	*43*	*41*	*45*	*68*	*67*	*71*
105.	Purdue University-West Lafayette	63	153	164	.36	5.7	.69	.28
	Psychological Sciences	*69*	*67*	*59*	*49*	*55*	*50*	*54*
106.	Rhode Island, University of	21	43	104	.16	7.5	.64	.16
	Psychology	*46*	*44*	*50*	*40*	*36*	*45*	*44*
107.	Rice University	9	6	27	NA	NA	NA	NA
	*Psychology**	*39*	*36*	*40*				
108.	Rochester, University of	28	90	85	.70	6.3	.83	.45
	Psychology	*50*	*54*	*48*	*63*	*48*	*63*	*66*
109.	Rosemead Graduate School of Prof Psychology	14	52	20	.00	6.0	.97	.06
	*School of Professional Psychology**	*42*	*46*	*39*	*33*	*52*	*77*	*37*
110.	Rutgers, The State University-New Brunswick	87	120	150	.31	6.2	.72	.31
	Psychology	*82*	*60*	*57*	*46*	*49*	*53*	*55*
111.	Rutgers, The State University-Newark	12	32	60	.50	6.2	.74	.32
	Psychology	*41*	*42*	*44*	*55*	*50*	*54*	*56*
112.	SUNY at Albany	22	52	77	.10	5.2	.64	.08
	Psychology	*46*	*46*	*47*	*38*	*61*	*45*	*39*
113.	SUNY at Binghamton	19	31	79	.26	5.5	.74	.19
	Psychology	*45*	*42*	*47*	*44*	*57*	*55*	*46*
114.	SUNY at Buffalo	40	103	136	.38	6.5	.72	.16
	Psychology	*56*	*57*	*55*	*50*	*47*	*53*	*44*
115.	SUNY at Stony Brook	41	133	239	.21	5.3	.73	.37
	Psychology	*57*	*63*	*69*	*42*	*60*	*53*	*60*
116.	Saint Louis University	20	80	138	.46	6.4	.74	.18
	Psychology	*45*	*52*	*55*	*53*	*48*	*54*	*46*
117.	South Carolina, University of-Columbia	33	86	144	.47	5.9	.68	.17
	Psychology	*52*	*53*	*56*	*54*	*53*	*49*	*45*
118.	South Dakota, University of-Vermillion	12	50	39	.45	4.4	.51	.10
	Psychology	*41*	*46*	*41*	*53*	*69*	*33*	*40*
119.	South Florida, University of-Tampa	32	41	139	.13	6.0	.67	.21
	*Psychology**	*52*	*44*	*55*	*39*	*52*	*48*	*48*
120.	Southern California, University of	33	68	114	.46	6.4	.63	.26
	Psychology	*52*	*49*	*52*	*53*	*48*	*44*	*52*

* indicates program was initiated since 1970.

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TABLE 8.1 Program Measures (Raw and Standardized Values) in Psychology

Prog No.	Survey Results				University Library	Research Support		Published Articles		Survey Ratings Standard Error			
	(08)	(09)	(10)	(11)	(12)	(13)	(14)	(17)	(18)	(08)	(09)	(10)	(11)
101.	3.6	2.1	1.1	1.1	0.7	.16	NA	122	.75	.08	.06	.09	.06
	61	*61*	*50*	*59*	*56*	*47*		*57*	*55*				
102.	4.4	2.5	1.1	1.5	0.7	.50	966	147	.70	.07	.06	.08	.06
	69	*69*	*49*	*70*	*56*	*67*	*50*	*61*	*52*				
103.	3.4	2.0	1.6	1.1	0.1	.34	525	158	.80	.09	.07	.08	.07
	58	*58*	*69*	*60*	*50*	*58*	*46*	*62*	*58*				
104.	3.8	2.2	1.1	1.2	0.9	.48	1072	92	.91	.10	.07	.11	.08
	63	*62*	*51*	*61*	*58*	*66*	*51*	*52*	*65*				
105.	3.5	2.0	1.4	1.2	-0.5	.21	600	199	.84	.09	.07	.09	.07
	59	*57*	*61*	*63*	*44*	*50*	*46*	*69*	*61*				
106.	1.8	1.2	0.9	0.4	NA	.05	NA	25	.57	.13	.12	.13	.05
	42	*42*	*40*	*42*		*41*		*41*	*45*				
107.	1.4	0.9	NA	0.2	-1.4	NA	NA	23	NA	.21	.15	NA	.05
	38	*36*		*38*	*35*			*41*					
108.	3.2	2.0	0.9	0.9	-0.6	.36	943	117	.61	.10	.07	.09	.07
	56	*58*	*41*	*56*	*43*	*59*	*49*	*56*	*47*				
109.	0.8	NA	NA	0.1	NA	.00	NA	14	.43	.19	NA	NA	.03
	33			*35*		*38*		*39*	*36*				
110.	3.5	2.0	1.4	1.2	0.8	.22	NA	235	.64	.09	.06	.10	.08
	60	*58*	*62*	*63*	*57*	*51*		*75*	*49*				
111.	2.3	1.6	0.7	0.6	NA	.25	NA	17	.58	.14	.12	.13	.07
	48	*50*	*35*	*47*		*53*		*40*	*45*				
112.	2.7	1.8	1.5	0.8	-1.0	.27	NA	114	.86	.11	.08	.14	.08
	51	*54*	*69*	*51*	*40*	*54*		*55*	*62*				
113.	2.6	1.5	1.5	0.8	NA	.42	406	92	.79	.13	.11	.10	.08
	51	*49*	*67*	*51*		*63*	*44*	*52*	*58*				
114.	3.1	1.9	1.2	1.0	0.3	.15	215	123	.80	.09	.04	.08	.07
	56	*56*	*55*	*56*	*52*	*47*	*43*	*57*	*58*				
115.	3.7	2.2	1.1	1.3	-0.6	.27	618	131	.68	.09	.06	.09	.07
	61	*62*	*50*	*63*	*43*	*54*	*46*	*58*	*51*				
116.	1.6	0.9	0.8	0.2	NA	.10	NA	19	.40	.16	.15	.14	.05
	40	*35*	*36*	*39*		*44*		*40*	*34*				
117.	2.0	1.3	1.3	0.4	-0.4	.12	255	111	.64	.13	.12	.14	.06
	44	*43*	*57*	*42*	*46*	*45*	*43*	*55*	*48*				
118.	1.4	1.1	NA	0.2	NA	.08	NA	6	.42	.11	.14	NA	.04
	38	*41*		*38*		*43*		*38*	*35*				
119.	2.6	1.5	1.4	0.8	NA	.06	326	64	.56	.10	.08	.09	.07
	51	*49*	*62*	*51*		*42*	*44*	*47*	*44*				
120.	3.3	1.9	1.3	1.0	0.4	.27	454	124	.79	.10	.07	.08	.07
	58	*57*	*60*	*57*	*53*	*54*	*45*	*57*	*58*				

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TABLE 8.1 Program Measures (Raw and Standardized Values) in Psychology

Prog No.	University - Department/Academic Unit	Program Size (01)	Program Size (02)	Program Size (03)	Characteristics of Program Graduates (04)	Characteristics of Program Graduates (05)	Characteristics of Program Graduates (06)	Characteristics of Program Graduates (07)
121.	Southern Illinois University-Carbondale	37	83	104	.46	6.2	.80	.32
	Psychology	*55*	*53*	*50*	*53*	*50*	*60*	*56*
122.	Southern Mississippi, Univ of-Hattiesburg	17	99	88	.03	5.5	.52	.03
	Psychology	*44*	*56*	*48*	*35*	*57*	*33*	*35*
123.	Stanford University	26	81	68	.70	5.1	.83	.58
	Psychology	*49*	*52*	*45*	*63*	*62*	*63*	*75*
124.	Syracuse University	29	92	136	.54	5.8	.61	.19
	Psychology	*50*	*54*	*55*	*56*	*54*	*42*	*47*
125.	Temple University	40	81	150	.42	7.4	.70	.07
	Psychology	*56*	*52*	*57*	*51*	*37*	*51*	*38*
126.	Tennessee, University of-Knoxville	27	125	166	.32	6.0	.63	.07
	Psychology	*49*	*61*	*59*	*47*	*52*	*44*	*38*
127.	Texas Christian University	15	32	36	.07	5.8	.71	.32
	Psychology	*43*	*42*	*41*	*36*	*55*	*52*	*56*
128.	Texas Tech University-Lubbock	19	87	137	.15	6.5	.65	.10
	Psychology	*45*	*53*	*55*	*40*	*47*	*46*	*40*
129.	Texas Woman's University-Denton	12	21	55	.00	6.9	.56	.11
	*Psychology**	*41*	*40*	*44*	*33*	*42*	*37*	*41*
130.	Texas, University of-Austin	46	110	151	.56	5.3	.65	.31
	Psychology	*59*	*58*	*57*	*61*	*60*	*46*	*55*
131.	Toledo, University of	17	26	57	.09	6.9	.62	.05
	Psychology	*44*	*41*	*44*	*37*	*43*	*43*	*36*
132.	Tulane University	17	38	48	.29	6.0	.42	.29
	Psychology	*44*	*43*	*43*	*46*	*52*	*24*	*54*
133.	Utah State University-Logan	20	59	58	.12	6.7	.60	.07
	Psychology	*45*	*47*	*44*	*39*	*45*	*42*	*38*
134.	Utah, University of-Salt Lake City	29	71	100	.74	6.8	.70	.34
	Psychology	*50*	*50*	*50*	*65*	*43*	*51*	*58*
135.	Vanderbilt University	30	64	70	.77	5.0	.73	.36
	Psychology	*51*	*49*	*46*	*66*	*63*	*54*	*59*
136.	Vermont, University of	15	42	73	.40	5.4	.72	.22
	Psychology	*43*	*44*	*46*	*51*	*58*	*52*	*49*
137.	Virginia Commonwealth University/Medical Col	29	73	118	.06	6.0	.63	.13
	*Psychology**	*50*	*50*	*52*	*36*	*52*	*44*	*42*
138.	Virginia Polytechnic Institute & State Univ	27	20	95	.00	5.8	.53	.00
	*Psychology**	*49*	*39*	*49*	*33*	*55*	*35*	*33*
139.	Virginia, University of	35	37	60	.16	5.4	.62	.35
	Psychology	*53*	*43*	*44*	*40*	*59*	*43*	*58*
140.	Washington State University-Pullman	21	60	66	.59	5.5	.71	.21
	Psychology	*46*	*48*	*45*	*58*	*58*	*52*	*48*

* indicates program was initiated since 1970.

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TABLE 8.1 Program Measures (Raw and Standardized Values) in Psychology

Prog No.	Survey Results				University Library	Research Support		Published Articles		Survey Ratings Standard Error			
	(08)	(09)	(10)	(11)	(12)	(13)	(14)	(17)	(18)	(08)	(09)	(10)	(11)
121.	2.4	1.6	0.7	0.7	-0.2	.11	NA	97	.62	.10	.10	.11	.07
	49	51	36	51	48	44		53	48				
122.	0.7	NA	NA	0.1	NA	.06	NA	33	.53	.17	NA	NA	.04
	32			37		41		42	42				
123.	4.8	2.6	1.0	1.8	2.0	.58	1731	155	1.00	.06	.07	.07	.05
	72	71	46	75	70	72	57	62	71				
124.	2.6	1.5	0.8	0.6	-0.3	.07	222	73	.72	.11	.10	.10	.06
	50	49	39	49	46	42	43	49	54				
125.	2.6	1.6	1.1	0.8	-0.4	.10	NA	70	.68	.11	.09	.06	.07
	51	50	50	53	45	44		48	51				
126.	2.3	1.5	0.8	0.7	-0.4	.15	485	58	.67	.09	.08	.11	.06
	48	49	40	50	45	47	45	46	50				
127.	1.9	NA	NA	0.3	NA	.13	1981	64	.80	.14	NA	NA	.05
	44			40		46	59	47	58				
128.	1.4	0.9	1.2	0.2	NA	.05	NA	72	.79	.15	.13	.14	.05
	39	36	54	38		41		49	58				
129.	0.4	NA	NA	0.1	NA	.00	NA	8	.33	.12	NA	NA	.04
	29			36		38		38	30				
130.	3.8	2.1	1.0	1.4	1.6	.44	1262	196	.87	.08	.06	.09	.07
	63	61	45	65	65	63	52	68	63				
131.	1.2	NA	NA	0.2	NA	.06	NA	15	.59	.12	NA	NA	.05
	36			38		41		39	46				
132.	1.9	1.2	0.8	0.5	-1.0	.06	195	38	.71	.14	.12	.10	.07
	43	43	38	45	39	41	42	43	53				
133.	1.4	1.0	1.1	0.2	NA	.00	186	44	.50	.14	.11	.13	.05
	38	37	52	38		38	42	44	40				
134.	2.9	1.9	1.4	0.8	-0.6	.17	NA	85	.76	.10	.07	.09	.07
	54	55	65	53	43	48		51	56				
135.	3.1	2.0	1.3	0.9	-0.7	30	391	95	.70	.09	.07	.09	.07
	56	58	59	56	42	56	44	52	52				
136.	2.3	1.5	1.2	0.5	NA	.20	NA	27	.73	.15	.11	.09	.06
	48	48	54	46		50		41	54				
137.	2.0	1.2	1.4	0.3	NA	.07	NA	70	.62	.14	.14	.17	.05
	44	42	61	41		42		48	48				
138.	2.3	1.3	1.6	0.5	-0.0	.07	NA	56	.59	.16	.13	.11	.06
	47	44	69	44	49	42		46	46				
139.	3.4	1.9	1.6	1.2	0.7	.29	215	79	.57	.09	.07	.07	.07
	58	57	71	62	57	55	43	50	45				
140.	2.2	1.4	1.1	0.5	-0.3	.10	NA	41	.48	.10	.12	.13	.07
	46	47	50	45	47	44		44	39				

NOTE: On the first line of data for every program, raw values for each measure are reported; on the second line values are reported in standardized form, with mean = 50 and standard deviation = 10. "NA" indicates that the value for a measure is not available.

TABLE 8.1 Program Measures (Raw and Standardized Values) in Psychology

Prog No.	University - Department/Academic Unit	Program Size			Characteristics of Program Graduates			
		(01)	(02)	(03)	(04)	(05)	(06)	(07)
141.	Washington University-Saint Louis	26	70	96	.68	5.8	.79	.37
	Psychology	*49*	*50*	*49*	*63*	*55*	*59*	*60*
142.	Washington, University of-Seattle	61	106	50	.49	6.0	.64	.32
	Psychology	*68*	*57*	*43*	*54*	*52*	*45*	*56*
143.	Wayne State University	40	118	103	.42	7.0	.71	.19
	Psychology	*56*	*60*	*50*	*51*	*41*	*51*	*47*
144.	West Virginia University	26	54	97	.38	5.2	.73	.14
	Psychology	*49*	*46*	*49*	*50*	*61*	*54*	*43*
145.	Western Michigan University	20	24	39	NA	NA	NA	NA
	*Psychology**	*45*	*40*	*41*				
146.	Wisconsin, University of-Madison	36	59	85	.57	5.7	.83	.42
	Psychology	*54*	*47*	*48*	*58*	*55*	*63*	*64*
147.	Wisconsin, University of-Milwaukee	18	23	48	.24	6.2	.62	.24
	Psychology	*44*	*40*	*43*	*44*	*50*	*43*	*50*
148.	Wyoming, University of	14	39	26	.51	6.4	.50	.08
	Psychology	*42*	*43*	*40*	*55*	*48*	*32*	*38*
149.	Yale University	49	88	91	.67	5.6	.57	.37
	Psychology	*61*	*54*	*48*	*62*	*56*	*38*	*60*
150.	Yeshiva University	16	96	332	.39	9.3	.64	.17
	Psychology	*43*	*55*	*82*	*50*	*17*	*45*	*45*

* indicates program was initiated since 1970.

NOTE: On the first line of data for every program, raw values for each measure are reported; on the second line values are reported in standardized form, with mean = 50 and standard deviation = 10. "NA" indicates that the value for a measure is not available.

TABLE 8.1 Program Measures (Raw and Standardized Values) in Psychology

Prog No.	Survey Results				University Library	Research Support		Published Articles		Survey Ratings Standard Error			
	(08)	(09)	(10)	(11)	(12)	(13)	(14)	(17)	(18)	(08)	(09)	(10)	(11)
141.	2.8	1.7	1.0	0.8	-0.4	.27	604	84	.73	.09	.09	.10	.07
	53	*52*	*47*	*53*	*45*	*54*	*46*	*51*	*54*				
142.	3.9	2.2	1.4	1.3	1.5	.38	1381	280	.77	.07	.05	.07	.06
	63	*62*	*62*	*64*	*64*	*60*	*54*	*82*	*57*				
143.	2.3	1.5	1.0	0.6	-0.4	.20	206	78	.63	.12	.11	.11	.07
	48	*47*	*47*	*47*	*46*	*50*	*43*	*50*	*48*				
144.	2.3	1.4	1.2	0.5	NA	.04	NA	71	.73	.13	.12	.15	.07
	47	*47*	*54*	*45*		*40*		*48*	*54*				
145.	1.9	1.3	0.8	0.4	NA	.00	NA	25	.45	.17	.15	.13	.06
	44	*44*	*39*	*43*		*38*		*41*	*37*				
146.	3.9	2.2	0.8	1.4	1.6	.67	5435	172	.83	.09	.08	.09	.07
	64	*63*	*36*	*66*	*65*	*77*	*91*	*65*	*61*				
147.	2.0	1.2	1.2	0.4	NA	.06	NA	41	.72	.16	.14	.10	.06
	44	*43*	*56*	*43*		*41*		*44*	*54*				
148.	1.1	0.9	1.2	0.2	NA	.14	NA	20	.50	.14	.14	.14	.04
	35	*36*	*53*	*39*		*46*		*40*	*40*				
149.	4.5	2.5	1.1	1.5	2.1	.49	1658	275	.82	.08	.06	.08	.06
	70	*69*	*50*	*69*	*70*	*67*	*56*	*81*	*59*				
150.	1.6	1.0	0.8	0.3	NA	.00	NA	12	.31	.13	.12	.11	.05
	40	*38*	*36*	*41*		*38*		*39*	*29*				

NOTE: On the first line of data for every program, raw values for each measure are reported; on the second line values are reported in standardized form, with mean = 50 and standard deviation = 10. "NA" indicates that the value for a measure is not available.

TABLE 8.2 Summary Statistics Describing Each Program Measure--Psychology

Measure	Number of Programs Evaluated	Mean	Standard Deviation	DECILES								
				1	2	3	4	5	6	7	8	9
Program Size												
01 Raw Value	150	29	18	14	16	19	21	24	29	32	38	44
Std Value	150	50	10	42	43	45	46	47	50	52	55	58
02 Raw Value	149	71	48	25	35	42	49	59	67	80	103	125
Std Value	149	50	10	40	42	44	45	47	49	52	57	61
03 Raw Value	149	102	73	30	43	57	69	85	102	123	149	189
Std Value	149	50	10	40	42	44	45	48	50	53	56	62
Program Graduates												
04 Raw Value	147	.39	.24	.06	.14	.23	.30	.41	.46	.53	.62	.68
Std Value	147	50	10	36	40	43	46	51	53	56	60	62
05 Raw Value	147	6.2	.9	7.4	6.9	6.4	6.2	6.0	5.9	5.7	5.4	5.3
Std Value	147	50	10	37	42	48	50	52	53	55	58	59
06 Raw Value	147	.69	.11	.55	.60	.63	.67	.70	.72	.74	.77	.83
Std Value	147	50	10	37	42	45	48	51	53	55	57	63
07 Raw Value	147	.24	.14	.07	.11	.15	.19	.21	.24	.30	.35	.41
Std Value	147	50	10	38	41	44	46	48	50	54	58	62
Survey Results												
08 Raw Value	150	2.5	1.0	1.2	1.7	1.9	2.2	2.4	2.7	3.1	3.5	3.9
Std Value	150	50	10	37	42	44	47	49	52	56	60	64
09 Raw Value	142	1.6	.5	.9	1.2	1.3	1.5	1.5	1.7	1.9	2.1	2.2
Std Value	142	50	10	36	42	44	48	48	52	56	60	62
10 Raw Value	131	1.1	.2	.8	.8	.9	1.0	1.1	1.1	1.2	1.3	1.4
Std Value	131	50	10	38	38	43	47	51	51	55	59	63
11 Raw Value	150	.7	.4	.2	.3	.4	.5	.6	.8	.9	1.1	1.3
Std Value	150	50	10	38	40	43	45	48	52	55	60	64
University Library												
12 Raw Value	86	.1	1.0	-1.1	-.7	-.5	-.4	-.2	.1	.5	.9	1.6
Std Value	86	50	10	38	42	44	45	47	50	54	58	65
Research Support												
13 Raw Value	146	.21	.17	.00	.05	.08	.13	.16	.20	.27	.34	.46
Std Value	146	50	10	38	41	42	45	47	49	54	58	65
14 Raw Value	79	1003	1075	215	255	363	456	564	697	950	1659	2198
Std Value	79	50	10	43	43	44	45	46	47	50	56	61
Publication Records												
17 Raw Value	150	81	63	17	27	39	57	66	79	92	122	165
Std Value	150	50	10	40	41	43	46	48	50	52	57	63
18 Raw Value	146	.66	.16	.42	.52	.60	.65	.70	.73	.76	.80	.84
Std Value	146	50	10	35	41	46	49	53	54	56	59	61

NOTE: Standardized values reported in the preceding table have been computed from exact values of the mean and standard deviation and not the rounded values reported here.

TABLE 8.3 Intercorrelations Among Program Measures on 150 Programs in Psychology

	Measure															
	01	02	03	04	05	06	07	08	09	10	11	12	13	14	17	18
Program Size																
01		.65	.64	.22	-.10	.02	.20	.57	.51	.08	.58	.47	.16	.31	.76	.16
02			.81	.10	-.15	-.06	-.06	.31	.23	-.04	.39	.36	-.04	.24	.49	-.01
03				-.05	-.43	-.11	-.17	.20	.08	-.01	.25	.24	-.17	.11	.34	-.17
Program Graduates																
04					.10	.17	.60	.64	.63	-.15	.58	.24	.56	.29	.35	.35
05						.15	.32	.13	.20	.05	.12	-.07	.27	.05	.12	.26
06							.44	.24	.33	.05	.21	.14	.31	.26	.09	.11
07								.74	.73	-.12	.67	.40	.79	.31	.43	.46
Survey Results																
08									.97	.05	.97	.73	.75	.49	.74	.57
09										.03	.93	.67	.73	.53	.71	.59
10											.05	-.03	-.02	-.03	.15	.14
11												.73	.71	.47	.77	.54
University Library																
12													.46	.45	.63	.37
Research Support																
13														.28	.42	.51
14															.53	.29
Publication Records																
17																.54
18																

NOTE: Since in computing correlation coefficients program data must be available for both of the measures being correlated, the actual number of programs on which each coefficient is based varies.

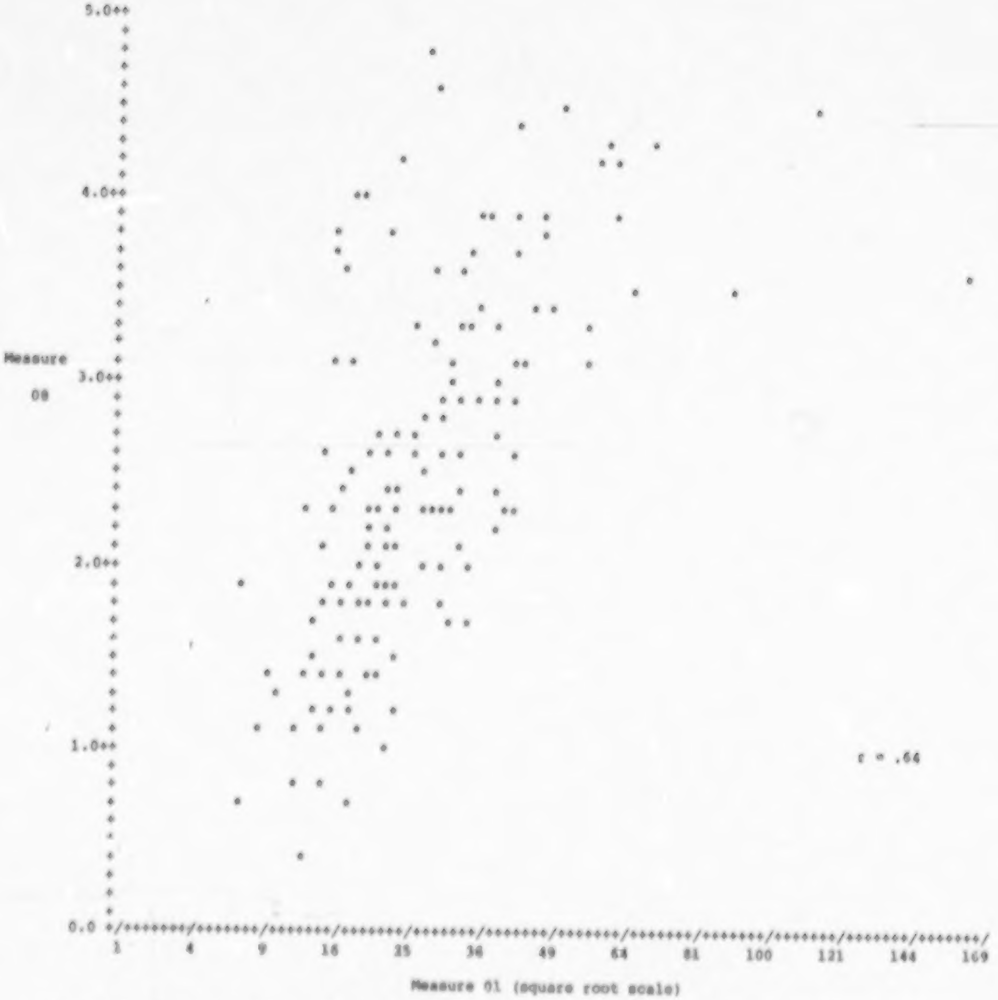

FIGURE 8.1 Mean rating of scholarly quality of faculty (measure 08) versus number of faculty members (measure 01)--150 programs in psychology.

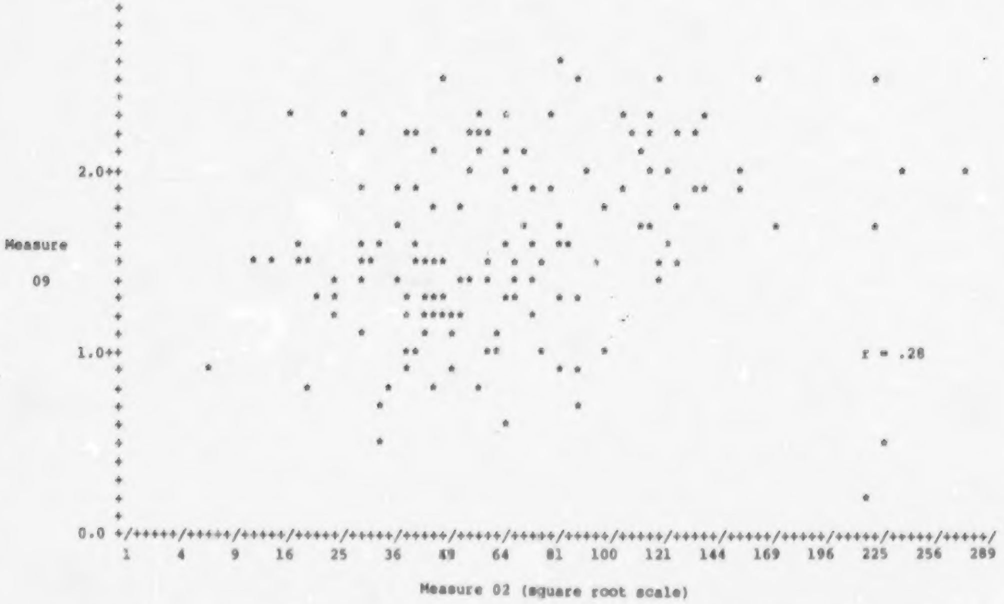

FIGURE 8.2 Mean rating of program effectiveness in educating research scholars/scientists (measure 09) versus number of graduates in last five years (measure 02)--141 programs in psychology.

TABLE 8.4 Characteristics of Survey Participants in Psychology

	Respondents	
	N	%
Field of Specialization		
Clinical Psychology	57	20
Developmental/Gerontological Psych.	20	7
Experimental Psychology	73	26
Industrial/Personnel Psychology	12	4
Physiological Psychology	25	9
Social Psychology	41	15
Other/Unknown	52	19
Faculty Rank		
Professor	143	51
Associate Professor	95	34
Assistant Professor	40	14
Other/Unknown	2	1
Year of Highest Degree		
Pre-1950	17	6
1950-59	61	22
1960-69	83	30
Post-1969	109	39
Unknown	10	4
Evaluator Selection		
Nominated by Institution	253	90
Other	27	10
Survey Form		
With Faculty Names	251	89
Without Names	29	10
Total Evaluators	280	100

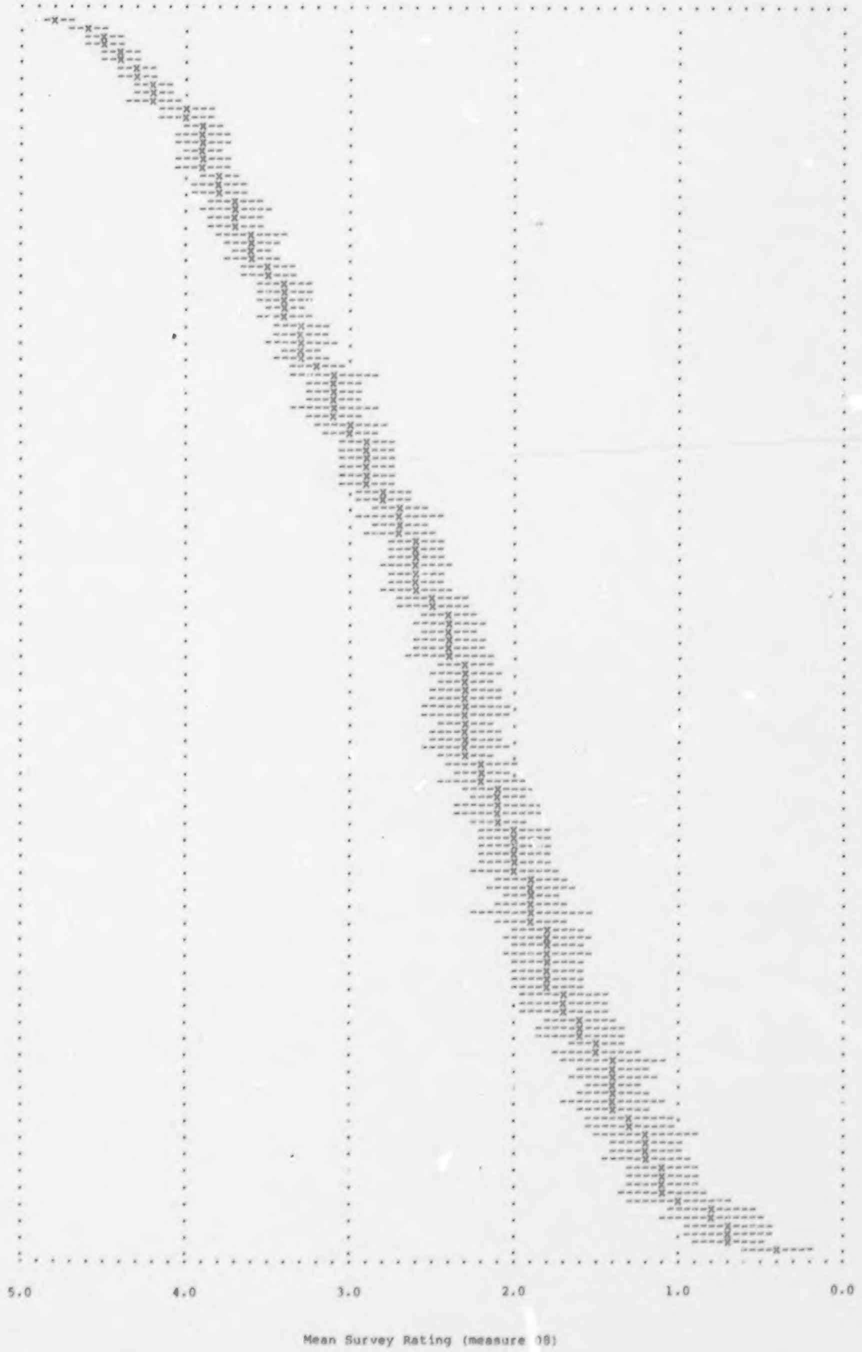

FIGURE 8.3 Mean rating of scholarly quality of faculty in 150 programs in psychology.

NOTE: Programs are listed in sequence of mean rating, with the highest-rated program appearing at the top of the page. The broken lines (---) indicate a confidence interval of ±1.5 standard errors around the reported mean (x) of each program.

IX
Sociology Programs

In this chapter 92 research-doctorate programs in sociology are assessed. These programs, according to the information supplied by their universities, have accounted for 3,061 doctoral degrees awarded during the FY1976-80 period--approximately 93 percent of the aggregate number of sociology doctorates earned from U.S. universities in this five-year span.[1] On the average, 49 full-time and part-time students intending to earn doctorates were enrolled in a program in December 1980, with an average faculty size of 21 members.[2] Thirteen programs were initiated since 1970, and no two programs are located in the same university. In addition to the 92 institutions represented in this discipline, another 3 were initially identified as meeting the criteria[3] for inclusion in the assessment:

University of California--San Francisco
Tufts University
U.S. International University

The U.S. International University chose not to participate in the assessment in any discipline. Sociology programs at the other two institutions have not been included in the evaluations in this discipline, since in each case the study coordinator either indicated that the institution did not at that time have a research-doctorate program in sociology or failed to provide the information requested by the committee.

Before examining individual program results presented in Table 9.1, the reader is urged to refer to Chapter II, in which each of the 16 measures used in the assessment is discussed. Summary statistics describing every measure are given in Table 9.2. For 14 of the measures, data are reported for at least 82 of the 92 sociology programs. For measure 12, a composite index of the size of a university library, data are available for 73 programs; for measure 14, the total university expenditures for research in this discipline, data are available for 66 programs. The programs not evaluated on measures 12 and 14 are typically smaller--in terms of faculty size and graduate student enrollment--than other sociology programs. Were data on these two measures available for all 92 programs, it is likely that their reported means would be appreciably lower (and that some of the correlations of these measures with others would be higher).

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[1] Data from the NRC's Survey of Earned Doctorates indicate that 3,303 research doctorates in sociology were awarded by U.S. universities between FY1976 and FY1980.

[2] See the reported means for measures 03 and 01 in Table 9.2.

[3] As mentioned in Chapter I, the primary criterion for inclusion was that a university had awarded at least 9 doctorates in sociology during the FY1976-78 period.

Intercorrelations among the 16 measures (Pearson product-moment coefficients) are given in Table 9.3. Of particular note are the high positive correlations of the reputational survey ratings (08 and 09) with the measures of program size (01, 02, and 03), university library size (12), and the total number of recently published articles by program faculty (17). Figure 9.1 illustrates the relation between the mean rating of the scholarly quality of faculty (measure 08) and the number of faculty members (measure 01) for each of 92 programs in sociology. Figure 9.2 plots the mean rating of program effectiveness (measure 09) against the total number of FY1976-80 program graduates (measure 02). Although in both figures there is a significant positive correlation between program size and reputational rating, it is quite apparent that some of the smaller programs received high mean ratings and that some of the larger programs received low mean ratings.

Table 9.4 describes the 181 faculty members who participated in the evaluation of sociology programs. These individuals constituted 66 percent of those asked to respond to the survey in this discipline and 9 percent of the faculty population in the 92 research-doctorate programs being evaluated.[*] A majority of the survey participants had earned their highest degree prior to 1970, and almost half held the rank of full professor. One exception should be noted with regard to the survey evaluations in this discipline. It has been called to the attention of the committee that the faculty list (used in the survey) for the Department of Sociology at the University of Texas (Austin) was missing the names of five members. The committee has decided to report the survey results for this program, but with the caution that the reputational ratings may have been influenced by the omission of these names.

To assist the reader in interpreting results of the survey evaluations, estimated standard errors have been computed for mean ratings of the scholarly quality of faculty in 92 sociology programs (and are given in Table 9.1). For each program the mean rating and an associated "confidence interval" of 1.5 standard errors are illustrated in Figure 9.3 (listed in order of highest to lowest mean rating). In comparing two programs, if their confidence intervals do not overlap, one may conclude that there is a significant difference in their mean ratings at a .05 level of significance.[5] From this figure it is also apparent that one should have somewhat more confidence in the accuracy of the mean ratings of higher-rated programs than lower-rated programs. This generalization results primarily from the fact that evaluators are not as likely to be familiar with the less prestigious programs, and consequently the mean ratings of these programs are usually based on fewer survey responses.

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[*] See Table 2.3 in Chapter II.

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[5] See pp. 30-32 for a discussion of the interpretation of mean ratings and associated confidence intervals.

TABLE 9.1 Program Measures (Raw and Standardized Values) in Sociology

Prog No.	University - Department/Academic Unit	Program Size (01)	Program Size (02)	Program Size (03)	Characteristics of Program Graduates (04)	Characteristics of Program Graduates (05)	Characteristics of Program Graduates (06)	Characteristics of Program Graduates (07)
001.	Akron, University of	16	8	54	NA	NA	NA	NA
	*Sociology**	*44*	*38*	*52*				
002.	American University	12	16	91	.09	15.0	.64	.18
	Sociology	*39*	*42*	*63*	*36*	*5*	*39*	*40*
003.	Arizona, University of-Tucson	26	25	26	.53	8.3	.67	.53
	Sociology	*56*	*46*	*43*	*57*	*49*	*42*	*63*
004.	Boston University	29	32	118	.51	9.1	.65	.21
	*Sociology**	*60*	*49*	*71*	*56*	*44*	*40*	*41*
005.	Bowling Green State University	17	21	20	.25	6.0	.53	.16
	*Sociology**	*45*	*44*	*41*	*44*	*64*	*28*	*38*
006.	Brandeis University	13	41	22	.54	9.9	.63	.27
	Sociology	*40*	*54*	*42*	*58*	*39*	*38*	*46*
007.	Brigham Young University	17	10	34	NA	NA	NA	NA
	Sociology (Family Studies Program)	*45*	*39*	*45*				
008.	Brown University	21	47	85	.63	7.7	.79	.29
	Sociology	*50*	*57*	*61*	*62*	*53*	*53*	*47*
009.	CUNY-Graduate School	34	63	145	.21	9.1	.62	.22
	Sociology	*66*	*64*	*79*	*42*	*44*	*37*	*42*
010.	California, University of-Berkeley	26	83	109	.55	8.6	.77	.39
	Sociology	*56*	*74*	*68*	*58*	*47*	*52*	*54*
011.	California, University of-Davis	16	17	17	.18	7.9	.69	.19
	Sociology	*44*	*42*	*40*	*40*	*52*	*44*	*40*
012.	California, University of-Los Angeles	41	50	99	.29	8.3	.68	.36
	Sociology	*75*	*58*	*65*	*46*	*49*	*43*	*52*
013.	California, University of-Riverside	13	30	36	.14	7.5	.64	.21
	Sociology	*40*	*48*	*46*	*39*	*55*	*39*	*42*
014.	California, University of-San Diego	20	16	57	.60	6.5	.90	.60
	*Sociology**	*49*	*42*	*52*	*61*	*61*	*64*	*68*
015.	California, University of-Santa Barbara	21	44	42	.24	7.4	.79	.36
	Sociology	*50*	*55*	*48*	*43*	*55*	*53*	*52*
016.	Case Western Reserve University	9	18	11	.58	11.0	.79	.53
	Sociology	*35*	*43*	*38*	*60*	*31*	*53*	*63*
017.	Catholic University of America	9	15	24	NA	NA	1.00	.10
	Sociology	*35*	*41*	*42*			*74*	*34*
018.	Chicago, University of	22	109	97	.56	6.6	.87	.44
	Sociology	*51*	*87*	*65*	*59*	*61*	*61*	*57*
019.	Colorado, University of	22	50	60	.33	8.3	.63	.23
	Sociology	*51*	*58*	*53*	*48*	*49*	*38*	*43*
020.	Columbia University	23	56	128	.45	10.4	.72	.29
	Sociology	*53*	*61*	*74*	*53*	*36*	*47*	*47*

* indicates program was initiated since 1970.

NOTE: On the first line of data for every program, raw values for each measure are reported; on the second line values are reported in standardized form, with mean = 50 and standard deviation = 10. "NA" indicates that the value for a measure is not available.

TABLE 9.1 Program Measures (Raw and Standardized Values) in Sociology

Prog No.	Survey Results				University Library	Research Support		Published Articles		Survey Ratings Standard Error			
	(08)	(09)	(10)	(11)	(12)	(13)	(14)	(17)	(18)	(08)	(09)	(10)	(11)
001.	1.6	1.1	1.3	0.6	NA	.00	NA	39	.81	.10	.09	.09	.06
	41	42	60	42		40		46	60				
002.	1.3	0.8	0.9	0.5	NA	.08	56	5	.33	.12	.11	.07	.06
	38	37	44	39		47	45	35	28				
003.	4.1	2.1	1.9	1.6	0.9	.23	208	82	.89	.08	.06	.04	.05
	65	61	78	65	57	59	46	60	65				
004.	2.7	1.7	1.3	1.0	-0.4	.21	187	58	.59	.09	.07	.10	.07
	52	54	58	51	44	57	46	52	45				
005.	1.4	1.0	1.0	0.5	NA	.00	NA	64	.88	.13	.13	.07	.06
	40	41	50	39		40		54	65				
006.	2.7	1.5	0.6	0.9	NA	.08	6	14	.39	.10	.10	.07	.07
	52	50	37	49		46	45	38	31				
007.	1.8	1.3	1.2	0.4	-0.6	.00	NA	36	.53	.13	.14	.11	.06
	43	47	56	38	42	40		45	41				
008.	2.8	1.8	1.0	1.0	-1.1	.19	300	45	.71	.11	.08	.07	.07
	53	56	49	50	38	56	47	48	53				
009.	3.3	1.8	1.0	1.2	NA	.06	232	56	.47	.09	.09	.08	.07
	57	55	47	56		45	47	51	37				
010.	4.5	2.3	0.7	1.7	2.2	.31	216	90	.81	.06	.07	.07	.05
	69	65	40	67	70	66	46	62	60				
011.	2.7	1.5	1.0	1.1	0.6	.13	52	43	.75	.10	.11	.10	.07
	52	50	47	52	54	51	45	47	56				
012.	4.1	2.2	1.5	1.6	2.0	.15	544	106	.81	.06	.07	.07	.05
	65	64	63	66	68	52	48	67	59				
013.	2.4	1.4	0.9	1.0	-1.0	.23	NA	22	.69	.10	.08	.10	.06
	49	48	45	50	38	59		40	52				
014.	3.3	1.7	1.3	1.4	-0.0	.00	NA	32	.75	.10	.09	.09	.07
	58	55	57	58	48	40		44	56				
015.	3.2	1.7	1.3	1.3	-0.1	.05	1072	71	.86	.08	.07	.08	.06
	57	55	58	58	47	44	52	56	63				
016.	1.2	0.8	0.3	0.6	-1.3	NA	NA	24	NA	.12	.08	.10	.06
	38	37	26	42	35			41					
017.	0.9	0.6	1.1	0.3	NA	NA	NA	26	NA	.12	.13	.12	.05
	35	34	52	36				42					
018.	4.7	2.4	1.0	1.8	0.9	.37	446	89	.91	.07	.06	.08	.04
	71	67	49	69	57	67	48	62	66				
019.	1.9	1.3	0.9	0.6	-0.9	.05	NA	16	.27	.09	.09	.08	.06
	44	46	46	43	39	44		38	24				
020.	4.2	2.2	0.6	1.7	1.7	.48	638	62	.74	.08	.08	.08	.05
	66	63	36	65	65	80	49	53	55				

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TABLE 9.1 Program Measures (Raw and Standardized Values) in Sociology

Prog No.	University - Department/Academic Unit	Program Size			Characteristics of Program Graduates			
		(01)	(02)	(03)	(04)	(05)	(06)	(07)
021.	Connecticut, University of-Storrs	28	25	41	.44	8.7	.76	.32
	Sociology	*59*	*46*	*48*	*53*	*47*	*51*	*49*
022.	Cornell University-Ithaca	27	53	29	.57	7.4	.77	.44
	Sociology	*58*	*60*	*44*	*59*	*55*	*52*	*57*
023.	Denver, University of	10	7	30	NA	6.5	.70	.60
	*Sociology**	*36*	*37*	*44*		*61*	*45*	*68*
024.	Duke University	17	33	36	.70	6.3	.91	.50
	Sociology	*45*	*50*	*46*	*65*	*63*	*65*	*61*
025.	Emory University	13	16	18	.71	9.0	.86	.36
	Sociology	*40*	*42*	*41*	*66*	*45*	*60*	*52*
026.	Florida State University-Tallahassee	17	23	31	.55	7.5	.68	.23
	Sociology	*45*	*45*	*45*	*58*	*55*	*43*	*43*
027.	Florida, University of-Gainesville	20	21	39	.37	6.3	.68	.28
	Sociology	*49*	*44*	*47*	*50*	*63*	*43*	*46*
028.	Fordham University	16	35	93	.46	10.5	.83	.17
	Sociology and Anthropology	*44*	*51*	*63*	*54*	*35*	*57*	*39*
029.	Georgia, University of-Athens	18	31	36	.17	9.0	.83	.28
	Sociology	*46*	*49*	*46*	*40*	*45*	*57*	*46*
030.	Harvard University	23	67	77	.70	8.3	.83	.44
	*Sociology**	*53*	*66*	*59*	*65*	*49*	*57*	*57*
031.	Hawaii, University of	19	14	29	.20	7.8	.62	.08
	Sociology	*48*	*41*	*44*	*41*	*53*	*37*	*33*
032.	Illinois, University of-Chicago Circle	36	22	43	.14	7.8	.86	.48
	Sociology	*69*	*45*	*48*	*39*	*53*	*60*	*60*
033.	Illinois, University-Urbana/Champaign	30	35	50	.06	6.6	.75	.50
	Sociology	*61*	*51*	*50*	*35*	*60*	*50*	*61*
034.	Indiana University-Bloomington	33	38	79	.59	6.3	.88	.66
	Sociology	*65*	*52*	*59*	*60*	*62*	*62*	*72*
035.	Iowa State University-Ames	28	36	41	.09	5.9	.88	.67
	Sociology and Anthropology	*59*	*51*	*48*	*36*	*65*	*62*	*72*
036.	Iowa, University of-Iowa City	19	27	38	.17	8.0	.62	.28
	Sociology	*48*	*47*	*47*	*40*	*51*	*37*	*46*
037.	Johns Hopkins University	8	35	19	.73	6.0	.88	.59
	Social Relations	*34*	*51*	*41*	*67*	*64*	*62*	*67*
038.	Kansas State University-Manhattan	14	5	15	NA	NA	NA	NA
	*Sociology**	*41*	*36*	*40*				
039.	Kansas, University of	19	17	49	.19	8.3	.90	.32
	Sociology	*48*	*42*	*50*	*41*	*50*	*64*	*49*
040.	Kent State University	20	6	20	NA	NA	NA	NA
	*Sociology and Anthropology**	*49*	*37*	*41*				

* indicates program was initiated since 1970.

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TABLE 9.1 Program Measures (Raw and Standardized Values) in Sociology

Prog No.	Survey Results				University Library	Research Support		Published Articles		Survey Ratings Standard Error			
	(08)	(09)	(10)	(11)	(12)	(13)	(14)	(17)	(18)	(08)	(09)	(10)	(11)
021.	2.4	1.5	1.0	0.9	-0.5	.04	899	41	.68	.09	.09	.10	.06
	49	50	48	49	43	43	51	47	51				
022.	3.5	2.0	1.0	1.4	1.6	.15	1004	87	.65	.08	.06	.08	.06
	59	60	49	60	64	52	51	61	63				
023.	1.3	0.7	0.9	0.8	NA	.10	1361	15	.60	.13	.11	.12	.07
	39	36	46	46		48	54	38	46				
024.	3.2	2.0	1.0	1.4	0.3	.53	594	78	.77	.08	.05	.07	.06
	56	59	49	60	51	84	49	58	57				
025.	1.7	1.1	0.8	0.7	-0.6	.08	NA	23	.77	.11	.13	.08	.06
	43	43	43	44	42	46		41	57				
026.	2.2	1.4	1.2	0.8	-0.4	.18	1571	64	.82	.10	.10	.08	.07
	48	49	56	46	44	55	55	54	61				
027.	1.9	1.1	1.1	0.6	0.8	.10	256	55	.85	.10	.10	.09	.06
	44	43	52	43	56	48	47	51	62				
028.	1.8	1.1	1.1	0.5	NA	.06	659	17	.31	.13	.12	.11	.06
	43	43	52	39		45	49	39	27				
029.	2.2	1.4	1.5	0.8	0.4	.22	707	63	.78	.11	.09	.10	.07
	47	48	64	47	52	59	49	54	58				
030.	4.3	2.3	0.7	1.8	3.0	.17	1119	141	.83	.09	.06	.07	.05
	67	65	37	67	78	55	52	79	61				
031.	1.8	1.0	0.8	0.5	-0.1	.00	182	22	.42	.11	.13	.12	.06
	44	40	41	39	47	40	46	40	34				
032.	2.7	1.5	1.5	1.1	NA	.00	193	50	.58	.09	.08	.08	.06
	51	51	64	52		40	46	49	45				
033.	3.5	2.0	1.2	1.5	2.0	.27	593	134	.83	.07	.06	.06	.06
	60	59	55	61	67	62	49	76	61				
034.	3.9	2.3	1.4	1.6	0.9	.21	487	99	.79	.07	.06	.07	.06
	63	66	62	63	57	58	48	65	58				
035.	1.8	1.4	1.1	0.5	-0.5	.00	911	62	.57	.12	.12	.11	.06
	44	48	51	39	43	40	51	53	44				
036.	2.3	1.4	1.0	0.8	0.3	.16	98	49	.79	.11	.10	.10	.06
	48	48	48	46	51	53	46	49	58				
037.	2.7	1.8	0.5	1.1	-0.4	NA	2299	40	NA	.12	.10	.09	.07
	52	55	31	53	44		59	46					
038.	1.2	0.9	1.0	0.3	NA	.07	90	17	.64	.11	.13	.06	.06
	37	39	49	36		46	46	39	49				
039.	2.0	1.3	1.1	0.8	0.1	.16	16	28	.63	.10	.09	.08	.06
	45	46	50	45	49	53	45	42	48				
040.	1.4	0.9	0.8	0.4	-1.8	.00	NA	33	.70	.13	.12	.11	.06
	40	39	43	38	30	40		44	52				

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TABLE 9.1 Program Measures (Raw and Standardized Values) in Sociology

Prog No.	University - Department/Academic Unit	Program Size (01)	Program Size (02)	Program Size (03)	Characteristics of Program Graduates (04)	Characteristics of Program Graduates (05)	Characteristics of Program Graduates (06)	Characteristics of Program Graduates (07)
041.	Kentucky, University of	23	34	39	.51	8.4	.77	.29
	Sociology	*53*	*50*	*47*	*56*	*49*	*52*	*47*
042.	Louisiana State University-Baton Rouge	16	28	25	.08	7.9	.74	.39
	Sociology	*44*	*47*	*43*	*36*	*52*	*49*	*54*
043.	Loyola University of Chicago	14	13	39	.08	11.0	.58	.08
	Sociology	*41*	*40*	*47*	*36*	*31*	*34*	*33*
044.	Maryland, University of-College Park	33	22	45	.16	8.5	.68	.11
	Sociology	*65*	*45*	*49*	*39*	*48*	*43*	*35*
045.	Massachusetts, University of-Amherst	29	52	74	.21	7.5	.81	.39
	Sociology	*60*	*59*	*58*	*42*	*55*	*55*	*54*
046.	Michigan State University-East Lansing	36	47	106	.35	8.3	.59	.20
	Sociology	*69*	*57*	*67*	*49*	*49*	*34*	*41*
047.	Michigan, University of-Ann Arbor	38	68	94	.74	7.8	.82	.49
	Sociology	*72*	*67*	*64*	*67*	*53*	*56*	*60*
048.	Minnesota, University of	28	46	89	.42	7.6	.75	.40
	Sociology	*59*	*56*	*62*	*52*	*54*	*50*	*55*
049.	Mississippi State University-Starkville	12	20	16	.36	11.6	.86	.36
	Sociology	*39*	*44*	*40*	*49*	*27*	*60*	*52*
050.	Missouri, University of-Columbia	26	40	21	.44	9.4	.79	.27
	Sociology	*56*	*53*	*41*	*53*	*42*	*53*	*46*
051.	Nebraska, University of-Lincoln	17	19	24	.56	9.3	.89	.33
	Sociology	*45*	*43*	*42*	*58*	*43*	*63*	*50*
052.	New Hampshire, University of	16	18	17	.43	7.0	.79	.29
	Sociology and Anthropology	*44*	*43*	*40*	*52*	*58*	*53*	*47*
053.	New School for Social Research	3	30	36	.17	11.4	.48	.07
	Sociology	*28*	*48*	*46*	*40*	*29*	*24*	*32*
054.	New York University	19	56	48	.34	8.8	.81	.29
	Sociology	*48*	*61*	*50*	*48*	*46*	*55*	*47*
055.	North Carolina State University-Raleigh	25	12	22	.18	9.8	.73	.36
	Sociology and Anthropology	*55*	*40*	*42*	*41*	*40*	*47*	*52*
056.	North Carolina, University of-Chapel Hill	21	58	48	.81	6.9	.90	.49
	Sociology	*50*	*62*	*50*	*71*	*59*	*64*	*61*
057.	North Texas State University-Denton	10	12	20	.08	9.2	1.00	.25
	*Sociology and Anthropology**	*36*	*40*	*41*	*36*	*44*	*74*	*44*
058.	Northwestern University	21	36	53	.69	6.9	.65	.37
	Sociology	*50*	*51*	*51*	*65*	*58*	*40*	*52*
059.	Notre Dame, University of	14	33	29	.49	8.3	.73	.20
	Sociology and Anthropology	*41*	*50*	*44*	*55*	*49*	*48*	*41*
060.	Ohio State University-Columbus	22	55	44	.22	6.6	.78	.34
	Sociology	*51*	*61*	*49*	*42*	*60*	*53*	*50*

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TABLE 9.1 Program Measures (Raw and Standardized Values) in Sociology

Prog No.	Survey Results				University Library	Research Support		Published Articles		Survey Ratings Standard Error			
	(08)	(09)	(10)	(11)	(12)	(13)	(14)	(17)	(18)	(08)	(09)	(10)	(11)
041.	2.0	1.4	0.9	0.7	-0.1	.00	NA	67	.74	.12	.11	.09	.07
	46	49	46	45	47	40		55	55				
042.	0.9	0.9	0.6	0.4	-0.3	.00	240	27	.56	.11	.11	.11	.06
	35	39	36	36	45	40	47	42	43				
043.	1.6	0.9	1.0	0.6	NA	.00	NA	30	.71	.10	.11	.08	.06
	41	38	50	41		40		43	53				
044.	2.7	1.6	1.6	1.1	0.2	.03	177	69	.55	.09	.08	.08	.06
	52	52	67	53	50	43	46	56	42				
045.	3.4	2.0	1.6	1.4	-0.7	.03	369	94	.79	.08	.06	.07	.06
	58	59	69	60	41	43	47	64	59				
046.	2.8	1.8	0.8	1.2	0.3	.11	2131	48	.47	.09	.06	.06	.06
	53	56	43	55	51	49	58	49	37				
047.	4.5	2.6	0.8	1.7	1.8	.45	12106	136	.71	.07	.05	.06	.05
	69	71	42	67	66	78	99	77	53				
048.	3.3	2.0	0.9	1.2	1.2	.21	1357	73	.75	.08	.07	.09	.06
	58	60	46	56	60	58	53	57	56				
049.	0.8	0.6	0.9	0.3	NA	.00	756	11	.42	.12	.12	.10	.06
	33	34	45	35		40	50	37	34				
050.	2.6	1.5	1.2	0.8	-0.2	.00	548	64	.77	.11	.08	.08	.07
	49	50	55	46	46	40	49	54	57				
051.	2.1	1.3	1.0	0.7	-0.5	.00	223	43	.65	.10	.10	.08	.06
	46	47	49	43	43	40	47	47	49				
052.	1.9	1.0	1.1	0.7	NA	.06	NA	22	.56	.09	.11	.06	.06
	44	40	51	44		45		40	43				
053.	1.6	0.9	0.3	1.1	NA	NA	NA	10	NA	.16	.12	.06	.07
	41	39	26	53				37					
054.	3.3	1.8	1.1	1.4	0.5	.05	59	28	.37	.08	.07	.08	.06
	57	56	53	59	53	44	46	42	30				
055.	1.6	1.0	0.9	0.3	NA	.04	NA	36	.48	.14	.14	.14	.06
	40	41	45	36		43		45	38				
056.	4.3	2.5	1.2	1.8	1.0	.14	2083	98	.91	.07	.05	.07	.05
	67	69	54	67	58	52	58	65	66				
057.	0.5	0.3	NA	0.2	NA	.10	487	14	.40	.08	.10	NA	.04
	31	28		32		48	48	38	32				
058.	3.3	1.9	1.3	1.4	0.3	.14	23	43	.71	.08	.07	.07	.06
	58	57	58	59	51	52	45	47	53				
059.	1.8	1.2	0.8	0.7	-1.3	.07	NA	18	.57	.11	.10	.10	.06
	43	45	42	43	35	46		39	44				
060.	2.4	1.5	0.7	0.9	0.9	.09	725	49	.82	.09	.08	.07	.06
	49	50	39	49	57	48	50	49	60				

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TABLE 9.1 Program Measures (Raw and Standardized Values) in Sociology

Prog No.	University - Department/Academic Unit	Program Size (01)	Program Size (02)	Program Size (03)	Characteristics of Program Graduates (04)	Characteristics of Program Graduates (05)	Characteristics of Program Graduates (06)	Characteristics of Program Graduates (07)
061.	Oklahoma State University-Stillwater	17	25	24	.31	6.1	.83	.13
	Sociology	*45*	*46*	*42*	*47*	*64*	*58*	*36*
062.	Oregon, University of-Eugene	19	22	40	.58	8.5	.71	.29
	Sociology	*48*	*45*	*47*	*60*	*48*	*46*	*47*
063.	Pennsylvania State University	17	25	21	.17	7.0	.69	.28
	Sociology	*45*	*46*	*41*	*40*	*58*	*44*	*46*
064.	Pennsylvania, University of	29	61	51	.48	7.5	.73	.28
	Sociology	*60*	*63*	*51*	*55*	*55*	*48*	*47*
065.	Pittsburgh, University of	23	31	52	.35	9.1	.74	.35
	Sociology	*53*	*49*	*51*	*48*	*44*	*49*	*51*
066.	Princeton University	17	27	35	.36	8.0	.74	.41
	Sociology	*45*	*47*	*46*	*49*	*51*	*49*	*55*
067.	Purdue University-West Lafayette	25	31	31	.41	5.5	.76	.40
	Sociology and Anthropology	*55*	*49*	*45*	*51*	*68*	*51*	*54*
068.	Rutgers, The State University-New Brunswick	37	60	137	.26	8.9	.77	.33
	Sociology	*70*	*63*	*77*	*44*	*46*	*52*	*50*
069.	SUNY at Albany	27	10	44	NA	NA	NA	NA
	*Sociology**	*58*	*39*	*49*				
070.	SUNY at Binghamton	10	14	69	NA	NA	NA	NA
	*Sociology**	*36*	*41*	*56*				
071.	SUNY at Buffalo	20	28	54	.35	8.4	.82	.31
	Sociology	*49*	*47*	*55*	*48*	*49*	*57*	*48*
072.	SUNY at Stony Brook	30	36	88	.33	7.9	.81	.52
	Sociology	*61*	*51*	*62*	*48*	*52*	*55*	*63*
073.	Southern California, University of	19	43	80	.59	8.1	.66	.26
	Sociology	*48*	*55*	*59*	*60*	*51*	*41*	*45*
074.	Southern Illinois University-Carbondale	17	37	27	.14	9.0	.79	.29
	Sociology	*45*	*52*	*43*	*38*	*45*	*53*	*47*
075.	Stanford University	16	47	48	.75	7.5	.80	.46
	Sociology	*44*	*57*	*50*	*67*	*55*	*55*	*58*
076.	Syracuse University	17	24	32	.19	10.0	.69	.31
	Sociology	*45*	*45*	*45*	*41*	*38*	*44*	*49*
077.	Temple University	28	27	57	.29	10.5	.58	.00
	Sociology	*59*	*47*	*52*	*46*	*35*	*33*	*28*
078.	Tennessee, University of-Knoxville	14	22	23	.28	8.0	.76	.36
	Sociology	*41*	*45*	*42*	*45*	*51*	*51*	*52*
079.	Texas Woman's University-Denton	4	13	19	.00	9.0	.58	.42
	*Sociology and Social Work**	*29*	*40*	*41*	*32*	*45*	*34*	*56*
080.	Texas, University of-Austin	28	60	86	.23	7.3	.78	.33
	Sociology	*59*	*63*	*61*	*43*	*56*	*52*	*50*

* indicates program was initiated since 1970.

NOTE: On the first line of data for every program, raw values for each measure are reported; on the second line values are reported in standardized form, with mean = 50 and standard deviation = 10. "NA" indicates that the value for a measure is not available.

TABLE 9.1 Program Measures (Raw and Standardized Values) in Sociology

Prog	Survey Results				University Library	Research Support		Published Articles		Survey Ratings Standard Error			
No.	(08)	(09)	(10)	(11)	(12)	(13)	(14)	(17)	(18)	(08)	(09)	(10)	(11)
061.	0.9 *35*	0.6 *34*	1.0 *49*	0.2 *34*	-1.9 *29*	.00 *40*	53 *45*	21 *40*	.59 *45*	.10	.11	.10	.05
062.	2.3 *48*	1.5 *50*	0.8 *42*	0.9 *49*	-0.9 *39*	.05 *44*	NA	31 *43*	.47 *37*	.09	.08	.09	.06
063.	2.2 *47*	1.6 *51*	1.1 *53*	0.9 *47*	0.7 *55*	.12 *50*	NA	43 *47*	.77 *57*	.10	.10	.10	.07
064.	3.9 *63*	2.1 *61*	1.3 *58*	1.5 *62*	0.7 *55*	.10 *49*	759 *50*	72 *57*	.66 *49*	.08	.07	.07	.06
065.	2.5 *50*	1.6 *53*	0.9 *46*	0.8 *46*	0.1 *49*	.09 *47*	246 *47*	34 *44*	.52 *41*	.09	.10	.10	.07
066.	3.6 *60*	2.0 *59*	1.0 *47*	1.5 *61*	0.9 *57*	.29 *65*	583 *49*	59 *52*	.59 *45*	.09	.07	.06	.06
067.	2.3 *48*	1.5 *50*	0.8 *43*	0.9 *48*	-0.5 *43*	.04 *43*	241 *47*	61 *53*	.68 *51*	.08	.09	.07	.06
068.	3.1 *56*	1.7 *54*	1.3 *59*	1.2 *55*	0.8 *56*	.03 *42*	529 *48*	59 *52*	.65 *49*	.10	.08	.08	.07
069.	3.1 *56*	1.8 *55*	1.9 *78*	1.3 *57*	-1.0 *38*	.07 *46*	NA	76 *58*	.67 *50*	.10	.08	.04	.07
070.	2.7 *52*	1.5 *51*	1.6 *68*	1.1 *52*	NA	.40 *74*	97 *46*	48 *49*	.60 *46*	.14	.11	.07	.07
071.	2.4 *49*	1.3 *48*	0.8 *41*	0.7 *45*	0.3 *51*	.05 *44*	NA	33 *44*	.70 *52*	.10	.09	.09	.05
072.	3.7 *62*	2.0 *60*	1.3 *59*	1.5 *62*	-0.6 *42*	.10 *48*	235 *47*	78 *58*	.63 *48*	.07	.06	.09	.05
073.	3.4 *58*	1.9 *57*	1.4 *61*	1.3 *58*	0.4 *52*	.26 *62*	216 *46*	86 *61*	.84 *62*	.08	.07	.07	.06
074.	1.6 *42*	1.0 *40*	0.9 *44*	0.6 *42*	-0.2 *46*	.06 *45*	53 *45*	41 *47*	.59 *45*	.10	.10	.09	.06
075.	4.2 *66*	2.3 *66*	1.3 *60*	1.6 *64*	2.0 *68*	.25 *61*	222 *47*	72 *57*	.88 *64*	.07	.06	.07	.05
076.	2.2 *48*	1.3 *47*	0.9 *44*	1.0 *50*	-0.3 *45*	.00 *40*	456 *48*	53 *50*	.65 *49*	.09	.10	.09	.06
077.	2.1 *47*	1.3 *47*	1.1 *51*	0.7 *45*	-0.4 *44*	.04 *43*	1457 *54*	36 *45*	.50 *39*	.11	.11	.09	.06
078.	1.6 *41*	1.0 *42*	1.1 *53*	0.6 *42*	-0.4 *44*	.00 *40*	27 *45*	25 *41*	.64 *49*	.11	.10	.08	.06
079.	0.2 *28*	0.2 *27*	NA	0.1 *30*	NA	NA	NA	2 *34*	NA	.08	.12	NA	.03
080.	3.5 *60*	2.0 *60*	1.3 *59*	1.4 *59*	1.6 *64*	.14 *52*	1275 *53*	78 *58*	.82 *61*	.08	.08	.09	.06

NOTE: On the first line of data for every program, raw values for each measure are reported; on the second line values are reported in standardized form, with mean = 50 and standard deviation = 10. "NA" indicates that the value for a measure is not available.

TABLE 9.1 Program Measures (Raw and Standardized Values) in Sociology

Prog No.	University - Department/Academic Unit	Program Size			Characteristics of Program Graduates			
		(01)	(02)	(03)	(04)	(05)	(06)	(07)
081.	Tulane University	9	9	17	.75	7.7	.67	.17
	Sociology	*35*	*38*	*40*	*68*	*53*	*42*	*39*
082.	Utah, University of-Salt Lake City	19	19	21	.14	7.3	.85	.15
	Sociology	*48*	*43*	*41*	*39*	*56*	*59*	*38*
083.	Vanderbilt University	14	25	24	.50	7.8	.83	.39
	Sociology and Anthropology	*41*	*46*	*42*	*56*	*52*	*57*	*54*
084.	Virginia Polytechnic Institute & State Univ	17	10	12	NA	NA	NA	NA
	*Sociology**	*45*	*39*	*39*				
085.	Virginia, University of	19	11	33	NA	NA	NA	NA
	Sociology	*48*	*39*	*45*				
086.	Washington State University-Pullman	26	72	42	.38	7.3	.93	.69
	Sociology	*56*	*69*	*48*	*50*	*56*	*67*	*74*
087.	Washington University-Saint Louis	15	32	41	.28	7.9	.71	.34
	Sociology	*43*	*49*	*48*	*45*	*52*	*46*	*51*
088.	Washington, University of-Seattle	27	37	35	.59	8.2	.72	.49
	Sociology	*58*	*52*	*46*	*60*	*50*	*47*	*60*
089.	Wayne State University	24	29	14	.14	10.2	.59	.10
	Sociology	*54*	*48*	*39*	*38*	*37*	*34*	*34*
090.	Western Michigan University	20	23	28	.13	7.0	.75	.19
	Sociology	*49*	*45*	*44*	*38*	*58*	*50*	*40*
091.	Wisconsin, University of-Madison	45	115	171	.59	7.5	.88	.59
	Sociology	*80*	*90*	*87*	*60*	*55*	*62*	*67*
092.	Yale University	21	40	56	.76	7.0	.78	.54
	Sociology	*50*	*53*	*52*	*68*	*58*	*53*	*64*

* indicates program was initiated since 1970.

NOTE: On the first line of data for every program, raw values for each measure are reported; on the second line values are reported in standardized form, with mean = 50 and standard deviation = 10. "NA" indicates that the value for a measure is not available.

TABLE 9.1 Program Measures (Raw and Standardized Values) in Sociology

Prog No.	Survey Results				University Library	Research Support		Published Articles		Survey Ratings Standard Error			
	(08)	(09)	(10)	(11)	(12)	(13)	(14)	(17)	(18)	(08)	(09)	(10)	(11)
081.	1.0	0.7	0.6	0.5	-1.0	NA	NA	14	NA	.12	.11	.11	.06
	36	*35*	*35*	*38*	*38*			*38*					
082.	1.4	0.9	1.1	0.4	-0.6	.05	NA	36	.68	.11	.12	.10	.05
	39	*40*	*53*	*37*	*42*	*44*		*45*	*51*				
083.	2.8	1.7	0.9	1.3	-0.7	.07	NA	55	.71	.08	.08	.11	.07
	53	*53*	*46*	*56*	*41*	*46*		*51*	*53*				
084.	1.5	1.0	1.2	0.7	-0.0	.00	86	58	.82	.12	.11	.10	.07
	41	*41*	*56*	*43*	*48*	*40*	*46*	*52*	*61*				
085.	2.7	1.5	1.5	1.2	0.7	.21	283	32	.68	.10	.10	.08	.07
	52	*50*	*64*	*56*	*55*	*58*	*47*	*44*	*51*				
086.	3.1	2.0	1.3	1.2	-0.3	.19	195	80	.69	.09	.06	.08	.07
	56	*59*	*58*	*55*	*45*	*56*	*46*	*59*	*52*				
087.	2.1	1.3	0.3	0.8	-0.4	.13	NA	27	.47	.11	.10	.07	.06
	46	*46*	*27*	*46*	*44*	*51*		*42*	*37*				
088.	4.0	2.3	1.4	1.6	1.5	.26	488	111	.74	.06	.07	.07	.05
	64	*66*	*62*	*63*	*62*	*62*	*48*	*69*	*55*				
089.	1.4	0.9	0.7	0.6	-0.4	.04	500	35	.50	.09	.09	.09	.06
	40	*39*	*38*	*41*	*44*	*44*	*48*	*45*	*39*				
090.	1.3	0.8	1.0	0.4	NA	.05	NA	29	.50	.10	.10	.08	.06
	38	*37*	*49*	*37*		*44*		*43*	*39*				
091.	4.6	2.7	1.0	1.9	1.6	.40	5781	145	.76	.06	.05	.07	.04
	70	*73*	*50*	*70*	*63*	*74*	*81*	*80*	*56*				
092.	3.7	1.9	1.0	1.5	2.1	.14	75	55	.71	.08	.06	.07	.05
	62	*58*	*49*	*63*	*69*	*52*	*46*	*51*	*53*				

NOTE: On the first line of data for every program, raw values for each measure are reported; on the second line values are reported in standardized form, with mean = 50 and standard deviation = 10. "NA" indicates that the value for a measure is not available.

TABLE 9.2 Summary Statistics Describing Each Program Measure--Sociology

Measure	Number of Programs Evaluated	Mean	Standard Deviation	DECILES								
				1	2	3	4	5	6	7	8	9
Program Size												
01 Raw Value	92	21	8	10	14	17	17	19	21	24	28	30
Std Value	92	50	10	36	41	45	45	48	50	54	59	61
02 Raw Value	92	33	21	11	16	21	25	29	33	37	47	60
Std Value	92	50	10	39	42	44	46	48	50	52	57	63
03 Raw Value	92	49	33	18	22	28	34	39	44	52	76	94
Std Value	92	50	10	41	42	44	45	47	49	51	58	64
Program Graduates												
04 Raw Value	82	.38	.21	.13	.17	.21	.29	.35	.44	.52	.58	.69
Std Value	82	50	10	38	40	42	46	49	53	57	60	65
05 Raw Value	83	8.2	1.5	10.3	9.1	8.7	8.3	8.0	7.8	7.5	7.0	6.5
Std Value	83	50	10	36	44	47	49	51	53	55	58	61
06 Raw Value	84	.75	.10	.62	.66	.69	.73	.76	.79	.81	.84	.88
Std Value	84	50	10	37	41	44	48	51	54	56	59	63
07 Raw Value	84	.33	.15	.14	.20	.27	.29	.32	.36	.39	.46	.53
Std Value	84	50	10	37	41	46	47	49	52	54	59	63
Survey Results												
08 Raw Value	92	2.5	1.1	1.2	1.5	1.8	2.1	2.4	2.7	3.1	3.4	4.0
Std Value	92	50	10	38	40	43	46	49	52	56	59	64
09 Raw Value	92	1.5	.5	.8	1.0	1.1	1.3	1.5	1.6	1.8	2.0	2.2
Std Value	92	50	10	38	41	43	47	51	52	56	60	64
10 Raw Value	90	1.0	.3	.7	.8	.9	1.0	1.0	1.1	1.2	1.3	1.4
Std Value	90	50	10	39	42	45	49	49	52	55	55	62
11 Raw Value	92	1.0	.5	.4	.5	.7	.8	.9	1.1	1.2	1.4	1.6
Std Value	92	50	10	37	40	44	46	48	53	55	60	64
University Library												
12 Raw Value	73	.2	1.0	-1.0	-.6	-.4	-.3	.0	.3	.7	.9	1.7
Std Value	73	50	10	38	42	44	45	48	51	55	57	65
Research Support												
13 Raw Value	86	.12	.12	.00	.00	.04	.06	.08	.11	.15	.21	.27
Std Value	86	50	10	40	40	43	45	47	49	53	58	63
14 Raw Value	66	790	1630	53	97	205	237	369	517	642	909	1399
Std Value	66	50	10	45	46	46	47	47	48	49	51	54
Publication Records												
17 Raw Value	92	52	31	16	24	32	36	45	55	63	75	90
Std Value	92	50	10	39	41	44	45	48	51	54	57	62
18 Raw Value	86	.66	.15	.45	.52	.59	.65	.68	.71	.76	.80	.84
Std Value	86	50	10	36	41	45	49	51	53	57	59	62

NOTE: Standardized values reported in the preceding table have been computed from exact values of the mean and standard deviation and not the rounded values reported here.

TABLE 9.3 Intercorrelations Among Program Measures on 92 Programs in Sociology

	Measure															
	01	02	03	04	05	06	07	08	09	10	11	12	13	14	17	18
Program Size																
01		.55	.62	.05	.20	.06	.24	.62	.65	.39	.54	.43	.18	.37	.69	.17
02			.68	.31	.18	.19	.32	.72	.73	-.03	.68	.54	.46	.38	.63	.25
03				.15	-.08	.00	.12	.60	.59	.13	.55	.47	.43	.30	.47	.04
Program Graduates																
04					.23	.29	.39	.51	.52	-.04	.50	.20	.43	.31	.33	.34
05						.30	.41	.29	.33	.24	.27	.10	.16	.10	.36	.50
06							.50	.15	.19	.17	.12	.07	.15	.15	.21	.16
07								.47	.51	.17	.49	.34	.36	.22	.47	.38
Survey Results																
08									.98	.33	.97	.75	.63	.30	.80	.49
09										.33	.94	.72	.63	.37	.82	.49
10											.30	.15	.07	-.18	.37	.32
11												.72	.64	.29	.77	.50
University Library																
12													.57	.25	.68	.48
Research Support																
13														.38	.54	.34
14															.45	.11
Publication Records																
17																.63
18																

NOTE: Since in computing correlation coefficients program data must be available for both of the measures being correlated, the actual number of programs on which each coefficient is based varies.

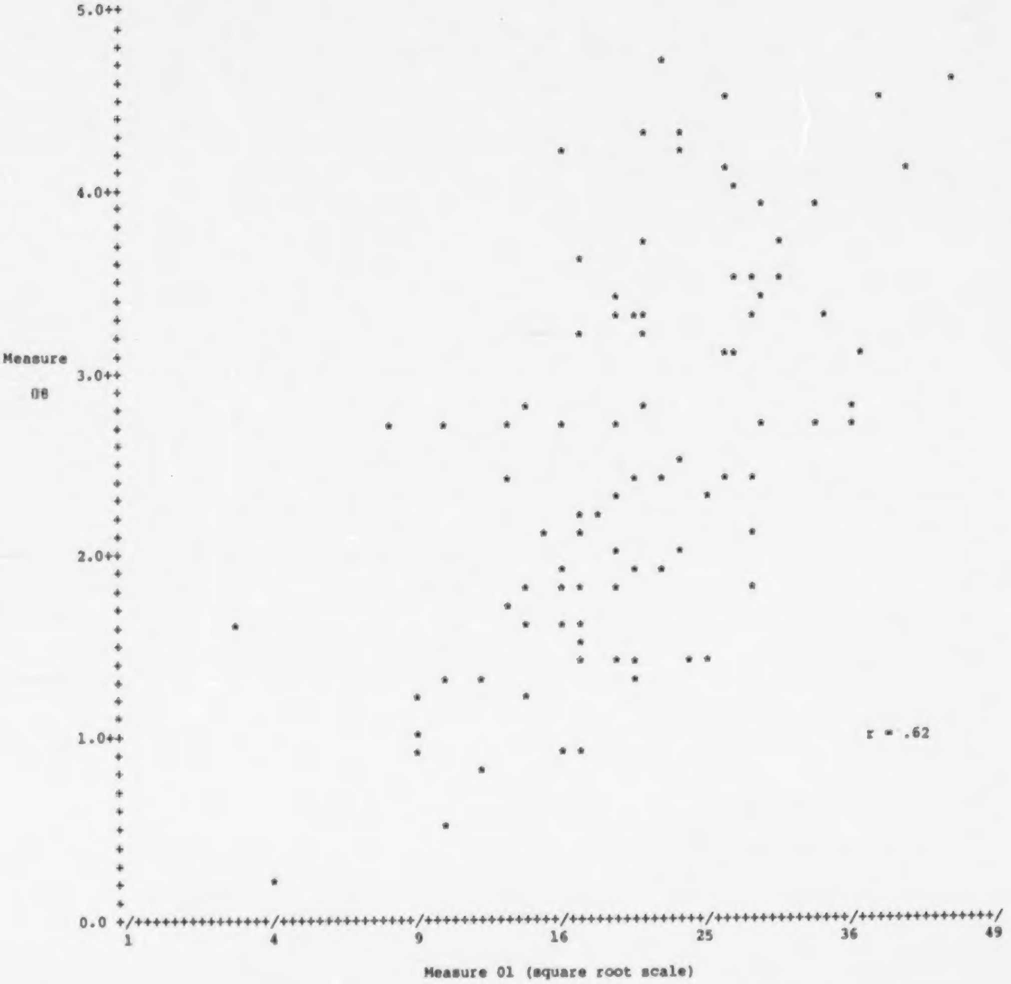


FIGURE 9.1 Mean rating of scholarly quality of faculty (measure 08) versus number of faculty members (measure 01)--92 programs in sociology.

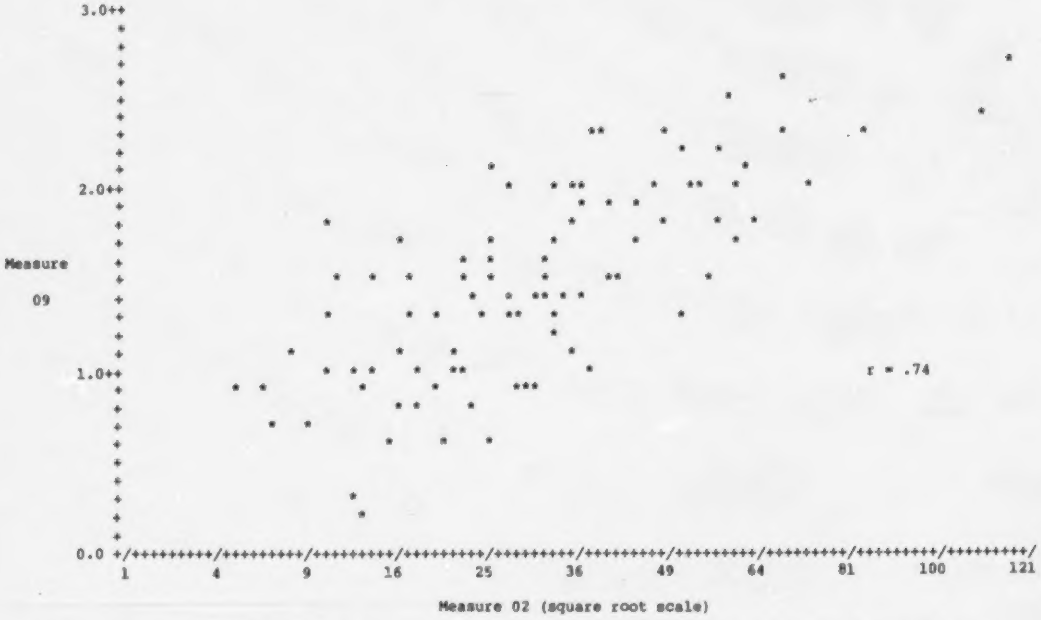
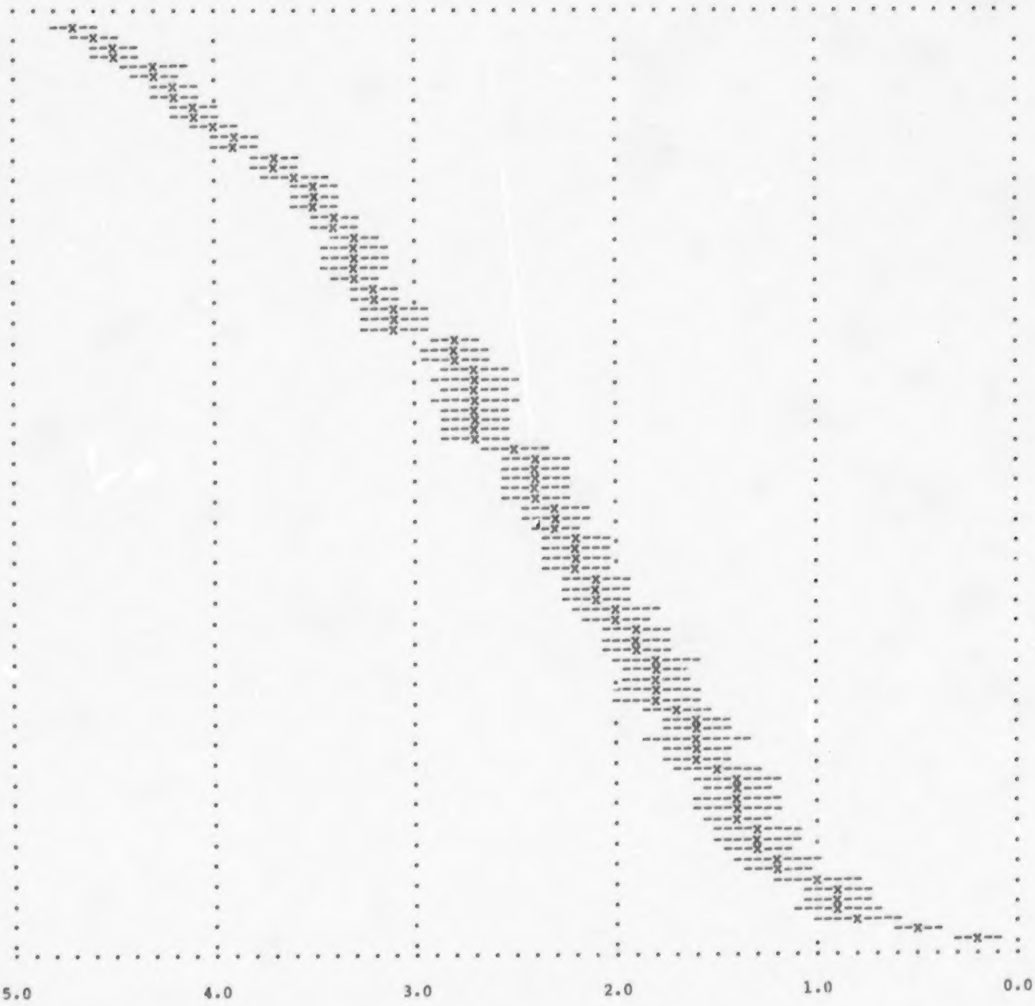


FIGURE 9.2 Mean rating of program effectiveness in educating research scholars/scientists (measure 09) versus number of graduates in last five years (measure 02)--92 programs in sociology.

TABLE 9.4 Characteristics of Survey Participants in Sociology

	Respondents	
	N	%
Field of Specialization		
Demography	12	7
Sociology	163	90
Other/Unknown	6	3
Faculty Rank		
Professor	86	48
Associate Professor	56	31
Assistant Professor	38	21
Other/Unknown	1	1
Year of Highest Degree		
Pre-1950	7	4
1950-59	37	20
1960-69	59	33
Post-1969	78	43
Evaluator Selection		
Nominated by Institution	155	86
Other	26	14
Survey Form		
With Faculty Names	164	91
Without Names	17	9
Total Evaluators	181	100



Mean Survey Rating (measure 08)

FIGURE 9.3 Mean rating of scholarly quality of faculty in 92 programs in sociology.

NOTE: Programs are listed in sequence of mean rating, with the highest-rated program appearing at the top of the page. The broken lines (---) indicate a confidence interval of ±1.5 standard errors around the reported mean (x) of each program.

X

Summary and Discussion

Results of the assessment of 639 research-doctorate programs in anthropology, economics, geography, history, political science, psychology, and sociology are presented in the preceding seven chapters. Included in each chapter are summary data describing the means and intercorrelations of the program measures for each discipline. In this chapter a comparison is made of the summary data reported in the seven disciplines. Also presented here are an analysis of the reliability (consistency) of the reputational survey ratings and an examination of some factors that might possibly have influenced the survey results. This chapter concludes with suggestions for improving studies of this kind--with particular attention given to the types of measures one would like to have available for an assessment of research-doctorate programs.

This chapter necessarily involves a detailed discussion of various statistics (means, standard deviations, correlation coefficients) describing the measures. Throughout, the reader should bear in mind that all these statistics and measures are necessarily imperfect attempts to describe the real quality of research-doctorate programs. Quality and some differences in quality are real, but these differences cannot be subsumed completely under any one quantitative measure. For example, no single numerical ranking--by measure 08 or by any weighted average of measures--can rank the quality of different programs with precision.

However, the evidence for reliability indicates considerable stability in the assessment of quality. For instance, a program that comes out in the first decile of a ranking is quite unlikely to "really" belong in the third decile, or vice versa. If numerical ranks of programs were replaced by groupings (distinguished, strong, etc.), these groupings again would not fully capture actual differences in quality since there would likely be substantial ambiguity about the borderline between adjacent groups. Furthermore, any attempt at linear ordering (best, next best, . . .) may also be inaccurate. Programs of roughly comparable quality may be better in different ways, so that there simply is no one best--as will also be indicated in some of the numerical analyses. However, these difficulties of formulating ranks should not hide the underlying reality of differences in quality or the importance of high quality for effective doctoral education.

SUMMARY OF THE RESULTS

Displayed in Table 10.1 are the numbers of programs evaluated (bottom line) and the mean values for each measure in the seven social and behavioral science disciplines.[1] As can be seen, the mean values reported for individual measures vary considerably among disciplines. The pattern of means on each measure is summarized below, but the reader interested in a detailed comparison of the distribution of a measure may wish to refer to the second table in each of the seven preceding chapters.[2]

Program Size (Measures 01-03). Based on the information provided to the committee by the study coordinator at each university, psychology programs had, on the average, the largest number of faculty members (29 in December 1980), followed by history (28). Psychology programs graduated the most students (71 Ph.D. recipients in the FY1975-79 period) and had the largest enrollment (102 doctoral students in December 1980). In contrast, geography programs were reported to have an average of only 13 faculty members, 16 graduates, and 22 doctoral students.

Program Graduates (Measures 04-07). The mean fraction of FY1975-79 doctoral recipients who as graduate students had received some national fellowship or training grant support (measure 04) ranges from .21 for graduates of economics programs to .48 for graduates in anthropology. With respect to the median number of years from first enrollment in a graduate program to receipt of the doctorate (measure 05), psychology graduates typically earned their degrees more than a year sooner than graduates in any other discipline. Graduates in geography and history reported the longest median times to the Ph.D. In terms of employment status at graduation (measure 06), an average of 78 percent of the Ph.D. recipients from economics programs reported that they had made firm job commitments by the time they had completed requirements for their degree, contrasted with 56 percent of the program graduates in history. A mean of 33 percent of the sociology graduates indicated that they had made firm commitments to take positions in Ph.D.-granting institutions (measure 07), while only 16 percent of those in history had made such plans. The low averages in history for measures 06 and 07 may be due, in part, to an apparent shortage of faculty openings in this discipline in recent years.

Survey Results (Measures 08-11). Differences in the mean ratings derived from the reputational survey are not large. The mean rating of scholarly quality of program faculty (measure 08) ranges from 2.3 in

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[1] As noted in Chapter II, for programs in history, data are not presented for measures 13 and 14; in anthropology and geography, data are not available for measure 14.

[2] The second table in each of the seven preceding chapters presents the standard deviation and decile values for each measure.

TABLE 10.1 Mean Values for Each Program Measure, by Discipline

	Anthro-pology	Economics	Geography	History	Political Science	Psych-ology	Soci-ology
Program Size							
01	17	23	13	28	23	29	21
02	28	41	16	38	35	71	33
03	51	68	22	51	50	102	49
Program Graduates							
04	.48	.21	.26	.26	.28	.39	.38
05	8.3	7.3	8.7	9.2	8.3	6.2	8.2
06	.60	.78	.72	.56	.68	.69	.75
07	.28	.26	.28	.16	.26	.24	.33
Survey Results							
08	2.8	2.3	2.8	2.6	2.6	2.5	2.5
09	1.6	1.3	1.6	1.6	1.5	1.6	1.5
10	1.0	1.1	1.0	1.1	1.1	1.1	1.0
11	1.1	.9	1.2	.9	1.0	.7	1.0
University Library							
12	.4	.1	.4	.2	.2	.1	.2
Research Support							
13	.22	.11	.14	NA	.06	.21	.12
14	NA	832	NA	NA	520	1003	790
Publication Records							
17	30	52	17	43	43	81	52
18	.61	.63	.51	.58	.63	.66	.66
Total Programs	70	93	49	102	83	150	92

economics to 2.8 in anthropology and geography, and programs were judged to be, on the average, between "reasonably" (2.0) and "minimally" (1.0) effective in educating research scholars/scientists (measure 09). In the opinions of the survey respondents, there has been "little or no change" (approximately 1.0 on measure 10) in the last five years in the overall average quality of programs. The mean rating of an evaluator's familiarity with the work of program faculty (measure 11) is close to 1.0 ("some familiarity") in every discipline except psychology (0.7)--about which more will be said later in this chapter.

The reader should be reminded that the distribution of ratings may vary from one discipline to another. If one examines, for example, the top program ratings recorded for measure 08 in each discipline, one finds noticeably higher top ratings in economics (five programs with ratings above 4.7) and history (three programs with ratings above 4.7) than in either anthropology and geography (no programs with ratings above 4.6). The study committee does not have an explanation of this observation but wishes to emphasize that many differences may be found in the distributions of survey ratings in the various disciplines and that the determinants of these differences are not known. As discussed in Chapter II, the survey ratings reflect each program's standing relative to other programs in the same discipline and provide no basis for making comparisons across disciplines.

University Library (Measure 12). Measure 12, based on a composite index of the size[3] of the library in the university in which a program resides, is calculated on a scale from -2.0 to 3.0, with means ranging from .1 in economics and psychology to .4 in anthropology and geography. These differences may be explained, in large part, by the number of programs evaluated in each discipline. In the disciplines with the fewest doctoral programs (anthropology and geography), the programs included are typically found in the larger institutions, which are likely to have high scores on the library size index. Ph.D. programs in economics and psychology are found in a much broader spectrum of universities that includes the smaller institutions as well as the larger ones.

Research Support (Measures 13-14). Measure 13, the proportion of program faculty who had received ADAMHA, NIH, OR NSF[4] research grant awards during the FY1978-80 period, has mean values ranging from .22 and .21 in anthropology and psychology, respectively, to .06 in political science. It should be emphasized that this measure does not take into account research support that faculty members have received from sources other than these three federal agencies. In terms of total university expenditures for R&D in a particular discipline (measure 14), the mean values are reported to range from $520,000 in political science to $1,003,000 in psychology. (As noted earlier, data are available for programs in only four of the seven disciplines.) The large differences in reported expenditures are likely to be related to three factors: the differential availability of research support in each of the disciplines, the differential average cost of doing research, and the differing numbers of individuals involved in the research effort.

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[3] The index, derived by the Association of Research Libraries, reflects a number of different measures, including number of volumes, fiscal expenditures, and other factors relevant to the size of a university library. See the description of this measure presented in Appendix D.

[4] Alcohol, Drug Abuse, and Mental Health Administration; National Institutes of Health; and National Science Foundation.

Publication Records (Measures 17 and 18). Considerable diversity is found in the mean number of articles by program faculty (measure 17).[5] An average of 81 articles published in the 1978-80 period have been attributed to program faculty members in psychology, contrasted with 17 articles by geography program faculty. These large differences reflect both the average faculty size in a particular discipline and the frequency with which scientists in that discipline publish; it may also depend on the length of a typical paper in a discipline. With respect to measure 18, the fraction of faculty who had published at least one article during this three-year period, the differences among the means in the seven disciplines are much smaller. The largest fractions are found in psychology and sociology (.66) and the smallest in geography (.51).

CORRELATIONS AMONG MEASURES

Relations among the program measures are of intrinsic interest and are relevant to the issue of validity of the measures as indices of the quality of a research-doctorate program. Measures that are logically related to program quality are expected to be related to each other. To the extent that they are, a stronger case might be made for the validity of each as a quality measure.

A reasonable index of the relationship between any two measures is the Pearson product-moment correlation coefficient. A table of correlation coefficients of all possible pairs of measures is presented in each of the seven preceding chapters. This chapter presents selected correlations to determine the extent to which coefficients are comparable in the seven disciplines. Special attention is given to the correlations involving the number of FY1975-79 program graduates (measure 02), survey rating of the scholarly quality of program faculty (measure 08), university R&D expenditures in a particular discipline (measure 14), and the total number of faculty articles (measure 17). These four measures have been selected because of their relatively high correlations with several other measures. Readers interested in correlations other than those presented in Tables 10.2-10.5 may refer to the third table in each of the preceding chapters.

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[5] See Appendix J for two alternative measures of publication records that have been compiled for programs in psychology.

Correlations with Measure 02. Table 10.2 presents the correlations of measure 02 with each of the other measures used in the assessment. As might be expected, correlations of this measure with the other two measures of program size--number of faculty and doctoral student enrollment--are reasonably high in all seven disciplines. Of greater interest are the strong positive correlations between measure 02 and measures derived from either reputational survey ratings or publication records. The coefficients describing the relationship of measure 02 with measure 17 are greater than .60 in anthropology, economics, history, and sociology and approximately .50 in the other three disciplines. The correlations with measure 18, the fraction of faculty with one or more articles published during the 1978-80 period, are much smaller. This result is not surprising, of course, since measure 17 reflects the total number of articles by program faculty, while measure 18 reflects the fraction of faculty members who publish (and is not size dependent). The correlations of measure 02 with measures 08, 09, and 11 are also moderately high--.56 or greater in all disciplines except psychology. It is quite apparent that the programs that received high survey ratings and with which evaluators were more likely to be familiar were also ones that had larger numbers of graduates. The weaker relationship in psychology may be explained, in part, by the fact that some of the programs have produced large numbers of graduates in clinical areas of psychology and may not have distinguished reputations in research. Although the committee gave serious consideration to presenting an alternative set of survey measures that were adjusted for program size, a satisfactory algorithm for making such an adjustment was not found. In attempting such an adjustment on the basis of the regression of survey ratings on measures of program size, it was found that some exceptionally large programs appeared to be unfairly penalized and that some very small programs received unjustifiably high adjusted scores.

Measure 02 also has positive correlations in most disciplines with measure 12, an index of university library size, and with measures 13 and 14, which pertain to the level of support for research in a program. Of particular note are the moderately large coefficients in economics for all three of these measures. The correlations of measure 02 with measures 04, 05, 06, and 07 are smaller but still positive in most of the disciplines. From this analysis it is apparent that the number of program graduates tends to be positively correlated with all of the other 15 variables and that the relationship of measure 02 with the other variables tends to be weakest for programs in psychology.

Correlations with Measure 08. Table 10.3 shows the correlation coefficients for measure 08, the mean rating of the scholarly quality of program faculty, with each of the other variables. The correlations of measure 08 with measures of program size (01, 02, and 03) are .40 or greater for all disciplines except psychology. Not surprisingly, the

TABLE 10.2 Correlations of the Number of Program Graduates (Measure 02) with Other Measures, by Discipline

	Anthropology	Economics	Geography	History	Political Science	Psychology	Sociology
Program Size							
01	.69	.61	.48	.77	.56	.65	.55
03	.68	.63	.52	.83	.82	.81	.68
Program Graduates							
04	.23	.36	.09	.34	.23	.10	.31
05	.10	.29	.19	.07	.03	-.15	.18
06	.43	.32	.13	.09	.06	-.06	.19
07	.35	.33	.30	.43	.20	-.06	.32
Survey Results							
08	.71	.75	.60	.74	.60	.31	.72
09	.68	.74	.68	.72	.56	.23	.73
10	-.15	.00	.00	.02	-.04	-.04	-.03
11	.67	.71	.57	.77	.58	.39	.68
University Library							
12	.68	.57	.30	.73	.66	.36	.54
Research Support							
13	.39	.54	.42	N/A	.24	-.04	.46
14	N/A	.52	N/A	N/A	.43	.24	.38
Publication Records							
17	.70	.76	.46	.82	.50	.49	.63
18	.24	.37	.22	.35	.18	-.01	.25

TABLE 10.3 Correlations of the Survey Ratings of Scholarly Quality of Program Faculty (Measure 08) with Other Measures, by Discipline

	Anthropology	Economics	Geography	History	Political Science	Psychology	Sociology
Program Size							
01	.83	.61	.46	.69	.63	.57	.62
02	.71	.75	.60	.74	.60	.31	.72
03	.65	.56	.42	.66	.47	.20	.60
Program Graduates							
04	.49	.42	.36	.63	.64	.64	.51
05	.34	.36	.16	.19	.10	.13	.29
06	.40	.31	.36	.05	.30	.24	.15
07	.50	.48	.51	.54	.52	.74	.47
Survey Results							
09	.96	.98	.98	.98	.98	.97	.98
10	.21	.35	.19	.24	.13	.05	.33
11	.95	.97	.94	.97	.98	.97	.97
University Library							
12	.64	.67	.52	.71	.74	.73	.75
Research Support							
13	.46	.76	.52	N/A	.40	.75	.63
14	N/A	.44	N/A	N/A	.43	.49	.30
Publication Records							
17	.75	.78	.78	.79	.71	.74	.80
18	.26	.47	.59	.53	.44	.57	.49

larger the program, the more likely its faculty is to be rated high in quality. This relationship is especially strong in anthropology, economics, history, and sociology.

Correlations of measure 08 with measure 04, the fraction of students with national fellowship awards, are greater than .60 in history, political science, and psychology and range between .36 and .51 in the other four disciplines. In contrast, for programs in the physical sciences and engineering, the corresponding coefficients (reported in earlier volumes) are considerably smaller. The correlation of rated faculty quality with measure 05, the shortness of time from matriculation in graduate school to award of the doctorate, is positive but small in each of the social and behavioral science disciplines. Correlations of ratings of faculty quality with measure 06, the fraction of program graduates with definite employment plans, are also small but positive in most of the disciplines. In every discipline the correlation of measure 08 is higher with measure 07, the fraction of graduates having agreed to employment at a Ph.D.-granting institution. These coefficients are greater than .70 in psychology and range between .47 and .54 in the other six disciplines.

The correlations of measure 08 with measure 09, the rated effectiveness of doctoral education, are uniformly very high, at or above .96 in every discipline. This finding is consistent with results from the Cartter and Roose-Andersen studies.[6] The coefficients describing the relationship between measure 08 and measure 11, familiarity with the work of program faculty, are also very high, ranging from .94 to .98. In general, evaluators were more likely to have high regard for the quality of faculty in those programs with which they were most familiar. That the correlation coeffients are as large as observed may simply reflect the fact that "known" programs tend to be those that have earned strong reputations.

Correlations of ratings of faculty quality with measure 10, the ratings of perceived improvement in program quality, are below .25 in all disciplines except economics and sociology. One might have expected that a program judged to have improved in quality would have been somewhat more likely to receive high ratings on measure 08 than would a program judged to have declined--thereby imposing a small positive correlation between these two variables.

Correlations ranging from .52 to .75 are observed between measure 08 and measure 12 (university library size). Moderate to high correlations also are found between measure 08 and support for research (measures 13 and 14) and publication records (measures 17 and 18). Of particular note are the strong correlations with measure 17, the total number of published articles by program faculty--ranging from .71 to .80.[7] In all disciplines the correlations with measure 17 are appreciably higher than those with measure 18, the fraction of faculty with one or more articles published during the 1978-80 period.

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[6] Roose and Andersen, p. 19.

[7] See Appendix J for the correlations of measure 08 with measures 15 and 16 (alternative measures of publication records) in psychology. These coefficients are nearly as high as those found between measures 08 and 17.

Correlations with Measure 14. Correlations of measure 14, reported dollars of support for research and development, with other measures are shown in Table 10.4. (Data on research expenditures in anthropology, geography, and history are not available.) The pattern of relations is quite similar for programs in economics, political science, psychology, and sociology: moderately high correlations with both measures of program size and reputational survey results (except measure 10) and somewhat higher correlations with measure 17, the total number of faculty articles. In interpreting these relationships one must keep in mind the fact that the research expenditure data have not been adjusted for the number of faculty and other staff members involved in research in a program. The correlation with measure 13, which has been adjusted for faculty size, ranges from .28 to .38.

Correlations with Measure 17. Measure 17 is the number of published articles by program faculty during the 1978-80 period. The correlations of this measure with all others appear in Table 10.5. Of particular interest are the high correlations with the reputational survey results (excluding measure 10). Most of those coefficients exceed .70. Measure 17 is positively related to the measures of program size (01, 02, and 03); moderately high correlations are also observed between measure 17 and measures 12 and 14. Also of note are the correlations with measure 07, the fraction of graduates with commitments to take positions in Ph.D.-granting universities. These coefficients range from .34 (in anthropology) to .47 (in sociology).

For psychology programs, data have also been compiled on two alternative measures of publication records--measure 15, the total number of 1978-79 articles attributed to faculty and other program staff, and measure 16, the estimated "overall influence" of these articles. The relationship of these two measures with each of the other measures used in the evaluation of psychology programs is reported in Appendix J. Of particular interest is the correlation of measure 15 with measure 17 since these measures were derived from different sources (see Appendix J) and represent independent estimates of total publication productivity for a program. The coefficient describing the relation of these two measures is as high as .78.

Despite the appreciable correlations between reputational ratings of quality and program size measures, the functional relations between the two probably are complex. If there is a minimum size for a high-quality program, this size is likely to vary from discipline to discipline. Increases in size beyond the minimum may represent more high-quality faculty, or a greater proportion of inactive faculty, or a faculty with heavy teaching responsibilities. In attempting to select among these alternative interpretations, a single correlation coefficient provides insufficient guidance. Nonetheless, certain similarities across disciplines may be seen in the correlations among the measures. High correlations consistently appear among measures 08, 09, and 11 from the reputational survey, and these measures also are prom-

TABLE 10.4 Correlations of the University Research Expenditures in a Discipline (Measure 14) with Other Measures, by Discipline

	Anthropology	Economics	Geography	History	Political Science	Psychology	Sociology
Program Size							
01	N/A	.49	N/A	N/A	.55	.35	.37
02	N/A	.52	N/A	N/A	.43	.24	.38
03	N/A	.45	N/A	N/A	.27	.11	.30
Program Graduates							
04	N/A	.11	N/A	N/A	.32	.29	.31
05	N/A	.25	N/A	N/A	-.12	.05	.10
06	N/A	.18	N/A	N/A	.11	.26	.15
07	N/A	.27	N/A	N/A	.20	.31	.22
Survey Results							
08	N/A	.44	N/A	N/A	.43	.49	.30
09	N/A	.44	N/A	N/A	.39	.53	.37
10	N/A	-.05	N/A	N/A	-.06	-.03	-.18
11	N/A	.38	N/A	N/A	.41	.47	.29
University Library							
12	N/A	.41	N/A	N/A	.40	.45	.25
Research Support							
13	N/A	.29	N/A	N/A	.35	.28	.38
Publication Records							
17	N/A	.54	N/A	N/A	.59	.53	.45
18	N/A	.31	N/A	N/A	.04	.29	.11

TABLE 10.5 Correlations of the Total Number of Articles Published by Faculty (Measure 17) with Other Measures, by Discipline

	Anthropology	Economics	Geography	History	Political Science	Psychology	Sociology
Program Size							
01	.82	.79	.56	.86	.78	.76	.69
02	.70	.76	.46	.82	.50	.49	.63
03	.53	.47	.33	.75	.42	.34	.47
Program Graduates							
04	.14	.32	.23	.39	.34	.35	.33
05	.26	.32	.06	.08	-.04	.12	.36
06	.30	.33	.37	.08	.29	.09	.21
07	.34	.38	.45	.39	.46	.43	.47
Survey Results							
08	.75	.78	.78	.79	.71	.74	.80
09	.72	.75	.77	.77	.70	.71	.82
10	.19	.26	.45	.21	.17	.15	.37
11	.71	.72	.73	.79	.69	.77	.77
University Library							
12	.53	.67	.48	.66	.71	.63	.68
Research Support							
13	.36	.60	.42	N/A	.26	.42	.54
14	N/A	.54	N/A	N/A	.59	.53	.45
Publication Records							
18	.39	.54	.67	.60	.59	.54	.63

inently related to program size (measures 01, 02, and 03), to publication productivity (measure 17), to R&D expenditures (measure 14), and to library size (measure 12). These results show that for all disciplines the reputational rating measures (08, 09, and 11) tend to be associated with program size and with other correlates of size: publication volume, R&D expenditures, and library size. Also, for most disciplines, the reputational measures 08, 09, and 11 tend to be positively related to the availability of fellowship support (measure 04), to the employment prospects of program graduates (especially measure 07), to the fraction of faculty holding research grants (measure 13), and to the fraction who have recently published (measure 18).

ANALYSIS OF THE SURVEY RESPONSE

Measures 08-11, derived from the reputational survey, may be of particular interest to many readers since measures of this type have been the most widely used (and frequently criticized) indices of quality of graduate education. In designing the survey instrument for this assessment the committee made several changes in the form that had been used in the Roose-Andersen study. The modifications served two purposes: to provide the evaluators with a clearer understanding of the programs that they were asked to judge and to provide the committee with supplemental information for the analysis of the survey response. One change was to restrict to 50 the number of programs that any individual was asked to evaluate. Probably the most important change was the inclusion of lists of names and ranks of individual faculty members involved in the research-doctorate programs to be evaluated on the survey form, together with the number of doctoral degrees awarded in the previous five years. Ninety percent of the evaluators were sent forms with faculty names and numbers of degrees awarded; the remaining 10 percent were given forms without this information, so that an analysis could be made of the effect of this modification on survey results. Another change was the addition of a question concerning an evaluator's familiarity with each of the programs. In addition to providing an index of program recognition (measure 11), the inclusion of this question permits a comparison between the ratings furnished by individuals who had considerable familiarity with a particular program and the ratings by those not as familiar with the program. Each evaluator was also asked to identify his or her own institution of highest degree and current field of specialization. This information enables us to compare, for each program, the ratings furnished by alumni of that institution with the ratings by other evaluators, as well as to examine differences in the ratings supplied by evaluators in certain specialty fields.

Before examining factors that may have influenced the survey results, some mention should be made of the distributions of responses to the four survey items and the reliability (consistency) of the ratings. For example, in judging the scholarly quality of faculty (measure 08), survey respondents in each discipline rated between 6 and 8 percent of the programs as being "distinguished" and between 2 and 7 percent as "not sufficient for doctoral education" (see Table 10.6).

TABLE 10.6 Distribution of Responses to Each Survey Item, by Discipline

	Survey Measure	Total	Anthropology	Economics	Geography	History	Political Science	Psychology	Sociology
08	SCHOLARLY QUALITY OF PROGRAM FACULTY								
	Distinguished	7.1	6.5	8.0	7.4	7.9	7.1	6.5	6.7
	Strong	15.8	18.3	12.0	19.8	16.6	16.2	14.5	16.8
	Good	21.3	27.6	17.9	27.4	20.5	25.7	16.6	21.1
	Adequate	18.1	21.4	19.5	20.5	16.7	18.9	14.3	19.7
	Marginal	9.6	8.5	13.4	8.6	8.3	10.5	7.3	11.2
	Not Sufficient for Doctoral Education	4.1	1.9	6.6	4.1	4.6	4.4	2.3	5.1
	Don't Know Well Enough to Evaluate	23.9	15.7	22.6	12.2	25.3	17.2	38.6	19.3
	TOTAL	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
09	EFFECTIVENESS OF PROGRAM IN EDUCATING SCIENTISTS								
	Extremely Effective	7.0	6.4	7.2	9.9	7.1	7.4	5.8	6.7
	Reasonably Effective	27.1	33.0	22.2	40.2	25.8	28.5	22.9	27.0
	Minimally Effective	16.0	17.5	17.9	21.9	15.6	18.5	10.8	15.9
	Not Effective	4.7	3.3	6.8	6.1	3.5	6.5	2.7	5.7
	Don't Know Well Enough to Evaluate	45.3	39.8	45.8	22.0	48.0	39.1	57.9	44.7
	TOTAL	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
10	CHANGE IN PROGRAM QUALITY IN LAST FIVE YEARS								
	Better	11.8	12.6	13.8	16.5	10.1	12.9	8.4	12.5
	Little or No Change	27.7	32.0	27.7	41.3	27.1	32.3	19.1	27.2
	Poorer	8.5	11.3	6.1	17.2	7.4	9.3	5.5	9.3
	Don't Know Well Enough to Evaluate	52.0	44.2	52.4	25.1	55.5	45.6	67.0	51.0
	TOTAL	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
11	FAMILIARITY WITH WORK OF PROGRAM FACULTY								
	Considerable	23.8	27.3	23.2	33.7	23.7	25.2	16.7	26.1
	Some	42.8	49.6	41.0	48.2	43.8	47.3	35.6	43.5
	Little or None	32.0	22.5	34.5	17.0	30.5	26.3	46.1	28.8
	No Response	1.5	.7	1.3	1.2	2.0	1.2	1.7	1.7
	TOTAL	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

NOTE: For survey measures 08, 09, 10 the "don't know" category includes a small number of cases for which the respondents provided no response to the survey item.

In evaluating the effectiveness in educating research scholars/scientists, they rated 6-10 percent of the programs as being "extremely effective" and approximately 3-7 percent as "not effective." Of particular interest in this table are the frequencies with which evaluators failed to provide responses to measures 08, 09, and 10. Approximately 24 percent of the total number of evaluations requested for measure 08 were not furnished because survey respondents in the social and behavioral sciences felt that they were not familiar enough with a particular program to evaluate it. In psychology, which had 150 programs included in the assessment, this percentage was nearly 39 percent; in geography, with 49 programs, it was 12 percent. The corresponding percentages of "don't know" responses for measures 09 and 10 are considerably larger--45 and 52 percent, respectively--suggesting that survey respondents found it more difficult (or were less willing) to judge program effectiveness and change than to judge the scholarly quality of program faculty.

The large fractions of "don't know" responses are a matter of some concern. However, given the broad coverage of research-doctorate programs, it is not surprising that faculty members would be unfamiliar with many of the less distinguished programs. As shown in Table 10.7, survey respondents in each discipline were much more likely to furnish evaluations for programs with high reputational standing than they were for programs of lesser distinction. For example, for social and behav-

TABLE 10.7 Survey Item Response Rates, by Discipline and Mean Rating on Measure 08

Survey Measure	Total	Anthropology	Economics	Geography	History	Political Science	Psychology	Sociology
08 SCHOLARLY QUALITY OF PROGRAM FACULTY								
Mean Rating on Measure 08								
4.0 or Higher	96.9	97.3	98.1	98.6	97.4	98.8	92.5	97.7
3.0 - 3.9	90.2	93.2	94.9	94.0	89.2	94.0	82.3	94.2
2.0 - 2.9	77.4	81.2	84.9	88.1	72.6	84.5	61.0	81.8
Less than 2.0	57.9	68.4	63.5	72.9	58.7	65.6	38.9	65.6
09 EFFECTIVENESS OF PROGRAM IN EDUCATING SCIENTISTS								
Mean Rating on Measure 08								
4.0 or Higher	86.3	91.9	89.6	96.1	84.2	90.1	75.5	86.1
3.0 - 3.9	70.0	71.9	74.9	88.4	66.1	74.7	60.6	70.4
2.0 - 2.9	53.2	54.2	57.7	76.3	47.3	57.6	39.8	52.5
Less than 2.0	35.7	39.2	37.7	59.0	36.2	44.0	22.6	38.7
10 CHANGE IN PROGRAM QUALITY IN LAST FIVE YEARS								
Mean Rating on Measure 08								
4.0 or Higher	76.7	83.4	82.0	91.1	73.6	82.1	59.1	78.8
3.0 - 3.9	62.5	68.4	70.0	84.3	59.3	67.3	47.7	64.8
2.0 - 2.9	48.5	50.0	54.0	74.4	41.8	54.4	32.2	48.5
Less than 2.0	28.0	34.3	29.5	55.2	27.0	34.3	16.6	29.9

ioral science programs that received mean ratings of 4.0 or higher on measure 08, almost 97 percent of the evaluations requested on measure 08 were provided; 86 and 77 percent, respectively, were provided on measures 09 and 10. In contrast, the corresponding response rates for programs with mean ratings below 2.0 are much lower--58, 36, and 28 percent response on measures 08, 09, and 10, respectively.

Of great importance to the interpretation of the survey results is the reliability of the response. How much confidence can one have in the reliability of a mean rating reported for a particular program? In the second table in each of the preceding seven chapters, estimated standard errors associated with the mean ratings of every program are presented for all four survey items (measures 08-11). While there is some variation in the magnitude of the standard errors reported in every discipline, they rarely exceed .15 for any of the four measures and typically range from .05 to .10. For programs with higher mean ratings the estimated errors associated with these means are generally smaller--a finding consistent with the fact that survey respondents were more likely to furnish evaluations for programs with high reputational standing. The "split-half" correlations[8] presented in Table 10.8 give an indication of the overall reliability of the survey results in each discipline and for each measure. In the derivation of these correlations individual ratings of each program were randomly divided into two groups (A and B), and a separate mean rating was computed for each group. The last column in Table 10.8 reports the correlations between the mean program ratings of the two groups and is not corrected for the fact that the mean ratings of each group are based on only half rather than a full set of the responses.[9] As the reader will note, the coefficients reported for measure 08, the scholarly quality of program faculty, are in the range of .97 to .98--indicating a very high degree of consistency in evaluators' judgments. The correlations reported for measures 09 and 11, the rated effectiveness of a program and the evaluators' familiarity with a program, are somewhat lower but still at a level of .92 or higher in each discipline. Not surprisingly, the reliability coefficients for ratings of change in program quality in the last five years (measure 10) are considerably lower, ranging from .63 to .94 in the seven social and behavioral science disciplines. While these coefficients represent tolerable reliability, it is quite evident that the responses to measure 10 are not as reliable as the responses to the other three items.

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[8] For a discussion of the interpretation of "split-half" coefficients, see Robert L. Thorndike and Elizabeth Hagan, Measurement and Evaluation in Psychology and Education, John Wiley & Sons, New York, 1969, pp. 182-185.

[9] To compensate for the smaller sample size the "split-half" coefficient may be adjusted using the Spearman-Brown formula: $r' = 2r/(1 + r)$. This adjustment would have the effect of increasing a correlation of .70, for example, to .82, a correlation of .80 to .89, a correlation of .90 to .95, and a correlation of .95 to .97.

TABLE 10.8 Correlations Between Two Sets of Average Ratings from Two Randomly Selected Groups of Evaluators in the Social Sciences

MEASURE 08: SCHOLARLY QUALITY OF PROGRAM FACULTY

Discipline	Mean Rating		Std. Deviation		Correlation	
	Group A	Group B	Group A	Group B	N	r
Anthropology	2.78	2.75	.79	.78	70	.97
Economics	2.28	2.30	1.20	1.16	93	.98
Geography	2.72	2.77	.88	.89	49	.98
History	2.60	2.62	1.07	1.03	102	.97
Political Science	2.59	2.58	.98	1.01	83	.98
Psychology	2.55	2.54	1.00	1.01	150	.97
Sociology	2.53	2.47	1.04	1.06	92	.98

MEASURE 09: EFFECTIVENESS OF PROGRAM IN EDUCATING SCHOLARS

Discipline	Mean Rating		Std. Deviation		Correlation	
	Group A	Group B	Group A	Group B	N	r
Anthropology	1.62	1.61	.42	.41	70	.94
Economics	1.33	1.33	.63	.64	93	.96
Geography	1.62	1.62	.49	.47	49	.95
History	1.54	1.56	.55	.51	102	.93
Political Science	1.48	1.46	.55	.56	83	.95
Psychology	1.56	1.52	.54	.54	150	.92
Sociology	1.47	1.48	.57	.53	92	.95

MEASURE 10: IMPROVEMENT IN PROGRAM IN LAST FIVE YEARS

Discipline	Mean Rating		Std. Deviation		Correlation	
	Group A	Group B	Group A	Group B	N	r
Anthropology	1.03	1.01	.26	.27	70	.78
Economics	1.13	1.11	.29	.27	93	.84
Geography	.97	1.01	.30	.32	49	.94
History	1.06	1.04	.21	.24	102	.63
Political Science	1.06	1.06	.22	.24	83	.75
Psychology	1.07	1.09	.27	.26	150	.64
Sociology	1.03	1.04	.31	.32	92	.85

MEASURE 11: FAMILIARITY WITH WORK OF PROGRAM FACULTY

Discipline	Mean Rating		Std. Deviation		Correlation	
	Group A	Group B	Group A	Group B	N	r
Anthropology	1.05	1.04	.32	.34	70	.93
Economics	.89	.88	.51	.51	93	.98
Geography	1.18	1.16	.33	.31	49	.93
History	.94	.92	.42	.41	102	.94
Political Science	.99	.99	.41	.42	83	.96
Psychology	.69	.70	.42	.44	150	.96
Sociology	.96	.98	.46	.46	92	.96

Further evidence of the reliability of the survey responses is presented in Table 10.9. As mentioned in Chapter VI of the first volume (mathematical and physical sciences) of the committee's reports, 11 mathematics programs[10] selected at random were included on a second form sent to 178 survey respondents in this discipline, and 116 individuals (65 percent) furnished responses to the second survey. A comparison of the overall results of the two survey administrations (columns 2 and 4 in Table 10.9) demonstrates the consistency of the ratings provided for each of the 11 programs. The average, absolute observed difference in the two sets of mean ratings is less than 0.1 for each measure. Columns 6 and 8 of Table 10.9 report the results based on the responses of only those evaluators who had been asked to consider a particular program in both administrations of the survey. (For a given program approximately 40-45 percent of the 116 respondents to the second survey had been asked to evaluate that program in the prior survey.) It is not surprising to find comparable small differences in the mean ratings provided by this subgroup of evaluators.

Critics of past reputational studies have expressed concern about the credibility of reputational assessments when evaluators provide judgments of programs about which they may know very little. As already mentioned, survey participants in this study were offered the explicit alternative, "Don't know well enough to evaluate." This response option was quite liberally used for measures 08, 09, and 10, as is shown in Table 10.6. In addition, evaluators were asked to indicate their degree of familiarity with each program. Respondents reported "considerable" familiarity with an average of only one program in every four or five. While this finding supports the conjecture that many program ratings are based on limited information, the availability of reported familiarity permits us to analyze how ratings vary as a function of familiarity.

This issue can be addressed in more than one way. It is evident from the data reported in Table 10.10 that mean ratings of the scholarly quality of program faculty tend to be higher if the evaluator has considerable familiarity with the program. There is nothing surprising or, for that matter, disconcerting about such an association. When a particular program fails to provoke more than vague images in the evaluator's mind, he or she is likely to take this as some indication that the program is not an extremely lustrous one on the national scene. While visibility and quality are scarcely the same, the world of research in higher education is structured to encourage high quality to achieve high visibility, so that any association of the two is far from spurious.

From the data presented in Table 10.10 it is evident that if mean ratings were computed on the basis of the responses of only those most familiar with programs, the values reported for individual programs would be increased. A largely independent question is whether a re-

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[10] Mathematics is the only discipline in which results were obtained from two separate administrations of the survey.

TABLE 10.9 Comparison of Mean Ratings for 11 Mathematics Programs Included in Two Separate Survey Administrations

	Survey Measure	All Evaluators				Evaluators Rating the Same Program in Both Surveys			
		First		Second		First		Second	
		N	$\overline{X}$	N	$\overline{X}$	N	$\overline{X}$	N	$\overline{X}$
Program A	08	100	4.9	114	4.9	50	4.9	50	4.9
	09	90	2.7	100	2.8	42	2.7	43	2.7
	10	74	1.2	83	1.2	38	1.1	34	1.2
	11	100	1.6	115	1.6	50	1.5	50	1.6
Program B	08	94	4.6	115	4.6	48	4.6	50	4.5
	09	81	2.6	91	2.5	40	2.6	39	2.5
	10	69	1.0	82	1.0	37	1.0	36	0.9
	11	98	1.4	116	1.4	50	1.5	50	1.5
Program C	08	86	3.4	103	3.6	42	3.4	44	3.5
	09	56	2.0	66	2.1	28	2.1	29	2.0
	10	55	1.1	62	1.3	30	1.2	27	1.4
	11	99	1.0	116	1.1	50	1.1	50	1.0
Program D	08	74	3.0	93	3.0	37	2.8	38	2.9
	09	50	1.8	48	1.6	27	1.7	16	1.6
	10	46	1.4	52	1.5	24	1.4	23	1.5
	11	90	1.0	113	0.9	46	1.0	46	0.9
Program E	08	69	3.0	95	3.1	39	3.0	46	3.1
	09	40	1.8	60	1.9	25	1.8	30	1.8
	10	36	0.8	58	0.9	24	0.8	29	0.9
	11	96	0.8	115	0.9	52	0.9	52	1.0
Program F	08	63	2.9	90	3.0	26	3.0	32	3.1
	09	35	1.8	46	1.7	10	1.6	13	1.8
	10	32	1.1	43	1.1	11	1.3	12	1.2
	11	95	0.7	115	0.8	43	0.7	44	0.7
Program G	08	69	2.7	92	2.8	39	2.7	39	3.0
	09	35	1.7	45	1.6	17	1.7	19	1.7
	10	36	1.1	43	1.2	17	1.1	19	1.2
	11	85	0.9	116	0.8	46	0.9	46	0.9
Program H	08	58	2.2	73	2.5	36	2.2	37	2.4
	09	32	1.3	43	1.3	22	1.2	19	1.3
	10	30	1.5	39	1.5	20	1.7	17	1.4
	11	90	0.7	116	0.6	51	0.7	52	0.6
Program I	08	55	2.0	74	1.9	30	1.9	30	2.0
	09	33	1.0	41	0.9	19	1.0	18	0.8
	10	27	1.2	31	1.1	15	1.1	13	1.2
	11	99	0.5	115	0.5	50	0.5	50	0.5
Program J	08	51	1.5	67	1.5	26	1.4	28	1.4
	09	31	0.8	36	0.7	14	0.6	14	0.7
	10	26	1.2	23	1.1	14	1.2	12	1.3
	11	96	0.5	113	0.3	49	0.4	48	0.4
Program K	08	33	1.2	48	1.2	17	1.1	21	1.4
	09	19	0.8	21	0.5	11	0.6	8	0.4
	10	12	0.8	15	0.9	5	1.0	5	0.8
	11	99	0.2	114	0.2	48	0.2	47	0.2

TABLE 10.10 Mean Ratings of Scholarly Quality of Program Faculty, by Evaluator's Familiarity with Work of Faculty

	MEAN RATINGS		CORRELATION	
	Considerable	Some/ Little	r	N
Anthropology	3.11	2.61	.92	70
Economics	2.69	2.25	.90	90
Geography	2.96	2.59	.95	49
History	2.85	2.51	.92	102
Political Science	2.90	2.54	.91	81
Psychology	3.03	2.42	.86	148
Sociology	2.96	2.37	.91	91

NOTE: N reported in last column represents the number of programs with a rating from at least one evaluator in each of the two groups.

striction of this kind would substantially change our sense of the relative standings of programs on this measure. Quite naturally, the answer depends in some degree on the nature of the restriction imposed. For example, if we exclude evaluations provided by those who confessed "little or no" familiarity with particular programs, then the revised mean ratings would be correlated at a level of at least .99 with the mean ratings computed using all of the data. (This similarity arises, in part, because only a small fraction of evaluations are given on the basis of no more than "little" familiarity with the program.)

The third column in Table 10.10 presents the correlation in each discipline between the array of mean ratings supplied by respondents claiming "considerable" familiarity and the mean ratings of those indicating "some" or "little or no" familiarity with particular programs. This coefficient is a rather conservative estimate of agreement since there is not a sufficient number of ratings from those with "considerable" familiarity to provide highly stable means. Were more such ratings available, one might expect the correlations to be higher. However, even in the form presented, the correlations, which are at least .90 in all disciplines except psychology, are high enough to suggest that the relative standing of programs on measure 08 is not greatly affected by the admixtures of ratings from evaluators who recognize that their knowledge of a given program is limited.

As mentioned previously, 90 percent of the survey sample members were supplied the names of faculty members associated with each program to be evaluated, along with the reported number of program graduates (Ph.D. or equivalent degrees) in the previous five years. Since earlier reputational surveys had not provided such information, 10 percent of the sample members, randomly selected, were given forms without faculty names or doctoral data, as a "control group." As one might

TABLE 10.11 Item Response Rate on Measure 08, by Selected Characteristics of Survey Evaluators in the Social Sciences

	Total	Anthropology	Economics	Geography	History	Political Science	Psychology	Sociology
EVALUATOR'S FAMILIARITY WITH PROGRAM								
Considerable	99.9	99.9	99.9	100.0	100.0	99.9	100.0	99.9
Some	97.4	98.8	97.2	98.3	96.4	99.0	96.3	96.6
Little or None	31.8	34.8	40.0	37.1	27.0	39.2	22.0	41.5
TYPE OF SURVEY FORM								
Names	77.2	85.4	79.1	87.9	75.6	84.1	62.7	81.6
No Names	66.4	75.6	59.5	87.2	67.0	70.9	50.1	71.9
INSTITUTION OF HIGHEST DEGREE								
Alumni	98.9	100.0	98.8	98.9	100.0	98.8	97.7	98.8
Nonalumni	75.8	84.1	77.2	87.6	74.4	82.6	61.2	80.5
EVALUATOR'S PROXIMITY TO PROGRAM								
Same Region	83.7	89.8	81.9	94.1	83.1	88.0	73.0	88.3
Outside Region	74.9	83.4	76.7	86.8	73.4	82.0	59.8	79.6

NOTE: The item response rate is the percentage of the total ratings requested from survey participants that included a response other than "don't know."

expect, those given faculty names were more likely than other survey respondents to provide evaluations of the scholarly quality of program faculty (see Table 10.11), although the differences found were not large. (The reader may recall that the provision of faculty names apparently had little effect on survey sample members' willingness to complete and return their questionnaires.[11])

In all disciplines except anthropology, the mean ratings provided by the group furnished faculty names are lower than the mean ratings supplied by other respondents (see Table 10.12). Although the differences are small, they attract attention because they are consistent with findings in the mathematical and physical sciences, humanities, engineering, and biological sciences and because the direction of the differences was not anticipated. After all, those programs more familiar to evaluators tended to receive higher ratings, yet when steps were taken to enhance the evaluator's familiarity, the resulting ratings are somewhat lower. One post hoc interpretation of this finding is that a program may be considered to have distinguished faculty if even only a few of its members are considered by the evaluator to be outstanding in their field. However, when a full list of program faculty is provided, the evaluator may be influenced by the number of individuals whom he or she could not consider to be distinguished. Thus, the presentation of these additional, unfamiliar names may occasionally result in a lower rating of program faculty.

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[11] See Table 2.3.

However interesting these effects may be, one should not lose sight of the fact that they are small at best and that their existence does not necessarily imply that a program's relative standing on measure 08 would differ much whichever type of survey form was used. Since only about 1 in 10 ratings was supplied without the benefit of faculty names, it is hard to establish any very stable picture of relative mean ratings of individual programs. However, the correlations between the mean ratings supplied by the two groups are reasonably high--ranging from .82 in psychology to .96 in geography (see Table 10.12). Were these coefficients adjusted for the fact that the group furnished forms without names constituted only about 10 percent of the survey respondents, they would be substantially larger. From this result it seems reasonable to conclude that differences in the alternative survey forms used are not likely to be responsible for any large-scale reshuffling in the reputational ranking of programs on measure 08. It also suggests that the inclusion of faculty names in the committee's assessment need not prevent comparisons of the results with those obtained from the Roose-Andersen survey.

Another factor that might be thought to influence an evaluator's judgment about a particular program is the geographic proximity of that program to the evaluator. There is enough regional traffic in academic life that one might expect proximate programs to be better known than those in distant regions of the country. This hypothesis may apply especially to the smaller and less visible programs and is confirmed

TABLE 10.12 Mean Ratings of Scholarly Quality of Program Faculty, by Type of Survey Form Provided to Evaluator

	MEAN RATINGS		CORRELATION	
	Names	No Names	r	N
Anthropology	2.79	2.56	.89	70
Economics	2.29	2.30	.95	93
Geography	2.74	2.78	.96	49
History	2.61	2.62	.90	102
Political Science	2.57	2.82	.90	83
Psychology	2.55	2.70	.82	146
Sociology	2.46	2.90	.91	92

NOTE: N reported in last column represents the number of programs with a rating from at least one evaluator in each of the two groups.

TABLE 10.13 Mean Ratings of Scholarly Quality of Program Faculty, by Evaluator's Proximity to Region of Program

	MEAN RATINGS		CORRELATION	
	Nearby	Outside	r	N
Anthropology	2.74	2.77	.89	68
Economics	2.34	2.31	.96	91
Geography	2.82	2.73	.89	48
History	2.73	2.60	.96	101
Political Science	2.61	2.59	.95	81
Psychology	2.59	2.54	.90	149
Sociology	2.59	2.52	.95	90

NOTE: N reported in last column represents the number of programs with a rating from at least one evaluator in each of the two groups.

by the survey results. For purposes of analysis, programs were assigned to one of nine geographic regions[12] in the United States, and ratings of programs within an evaluator's own region are categorized in Table 10.13 as "nearby." Ratings of programs in any of the other eight regions were put in the "outside" group. Findings reported elsewhere in this chapter confirm that evaluators were more likely to provide ratings if a program was within their own region of the country,[13] and it is reasonable to imagine that the smaller and the less visible programs received a disproportionate share of their ratings either from evaluators within their own region or from others who for one reason or another were particularly familiar with programs in that region.

Although the data in Table 10.13 suggest that "nearby" programs were given higher ratings than those outside the evaluator's region (except in anthropology), the differences in reported means are quite small and probably represent no more than a secondary effect that might be expected, because, as we have already seen, evaluators tended to rate higher those programs with which they were more familiar. Furthermore, the high correlations found between the mean ratings of the two groups indicate that the relative standings of programs are not dramatically influenced by the geographic proximity of those evaluating them.

Another consideration that troubles some critics is that large programs may be unfairly favored in a faculty survey because they are

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[12] See Appendix I for a list of the states included in each region.

[13] See Table 10.11.

TABLE 10.14 Mean Ratings of Scholarly Quality of Program Faculty, by Evaluator's Institution of Highest Degree

	MEAN RATINGS		NUMBER OF PROGRAMS WITH ALUMNI RATINGS
	Alumni	Nonalumni	N
Anthropology	3.89	3.40	26
Economics	3.47	3.14	36
Geography	3.66	3.15	28
History	4.05	3.46	32
Political Science	3.76	3.38	31
Psychology	4.13	3.40	42
Sociology	3.97	3.33	34

NOTE: The pairs of means reported in each discipline are computed for a subset of programs with a rating from at least one alumnus and are substantially greater than the mean ratings for the full set of programs in each discipline.

likely to have more alumni contributing to their ratings who, it would stand to reason, would be generous in the evaluations of their alma maters. Information collected in the survey on each evaluator's institution of highest degree enables us to investigate this concern. The findings presented in Table 10.14 support the hypothesis that alumni provided generous ratings--with differences in the mean ratings (for measure 08) of alumni and nonalumni ranging from .33 to .73 in the seven disciplines. Given the appreciable differences between the ratings furnished by program alumni and other evaluators, one might ask how much effect this has had on the overall results of the survey. The answer is "very little." As shown in the table, in history and psychology fewer than one program in every three received ratings from any alumnus; in geography slightly more than half of the programs were evaluated by one or more alumni.[14] Even in the latter discipline, however, the fraction of alumni providing ratings of a program is always quite small and should have had minimal impact on the overall mean rating of any program. To be certain that this was the case, mean ratings of the scholarly quality of faculty were recalculated for every social and behavioral science program--with the evaluations provided by alumni excluded. The results were compared with the mean scores based on a full set of evaluations. Out of the 639 social and behavioral science programs evaluated in the survey, none of the programs had an observed difference as large as 0.2, and for 593 programs (93 percent) their mean ratings remain unchanged (to the nearest tenth of a unit). On the basis of these findings the committee saw no reason to exclude alumni ratings in the calculation of program means.

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[14] Because of the small number of alumni ratings in every discipline, the mean ratings for this group are unstable and therefore the correlations between alumni and nonalumni mean ratings are not reported.

Another concern that some critics have is that a survey evaluation may be affected by the interaction of the research interests of the evaluator and the area(s) of focus of the research-doctorate program to be rated. It is said, for example, that some narrowly focused programs may be strong in a particular area of research but that this strength may not be recognized by a large fraction of evaluators who happen to be unknowledgeable in this area. This is a concern more difficult to address than those discussed in the preceding pages since little or no information is available about the areas of focus of the programs being evaluated (although in certain disciplines the title of a department or academic unit may provide a clue). To obtain a better understanding of the extent to which an evaluator's field of specialty may have influenced the ratings he or she has provided, an analysis was made of ratings provided by evaluators in psychology. Survey participants in this discipline were divided into two groups according to specialty field (as reported on the survey questionnaire): those specializing in clinical psychology or counseling and guidance and those in the other fields of psychology. The mean ratings of the two groups are reported in Table 10.15. The program ratings provided by clinical psychologists are, on the average, slightly higher than those provided by evaluators in nonclinical areas. Despite these differences there is a high degree of correlation in the mean ratings furnished by the two groups (r = .91). Although one cannot conclude from these findings that an evaluator's specialty field has no bearing on how he or she rates a program, these findings do suggest that the relative standings of programs in psychology would not be greatly altered if the ratings by either group were discarded. Similar findings, presented in the mathematical and physical sciences volume of the committee's report, were obtained from an analysis of survey evaluators in differing specialties within physics and within statistics/biostatistics.

TABLE 10.15 Mean Ratings of Scholarly Quality of Program Faculty, by Evaluator's Field of Specialty within Psychology

	MEAN RATINGS		CORRELATION	
	Clinical	Other	r	N
Psychology	2.63	2.52	.91	150

NOTE: N reported in last column represents the number of programs with a rating from at least one evaluator in each of the two groups.

INTERPRETATION OF REPUTATIONAL SURVEY RATINGS

It is not hard to foresee that results from this survey will receive considerable attention through enthusiastic and uncritical reporting in some quarters and sharp castigation in others. The study committee understands the grounds for both sides of this polarized response but finds that both tend to be excessive. It is important to make clear how we view these ratings as fitting into the larger study of which they are a part.

The reputational results are likely to receive a disproportionate degree of attention for several reasons, including the fact that they reflect the opinions of a large group of faculty colleagues and that they form a bridge with earlier studies of graduate programs. But the results will also receive emphasis because they alone, among all of the measures, seem to address quality in an overall or global fashion. While most recognize that "objective" program characteristics (i.e., publication productivity, research funding, or library size) have some bearing on program quality, probably no one would contend that a single one of these measures encompasses all that need be known about the quality of research-doctorate programs. Each is obviously no more than an indicator of some aspect of program quality. In contrast, the reputational ratings are global from the start because the respondents are asked to take into account many objective characteristics and to arrive at a general assessment of the quality of the faculty and the effectiveness of the program. This generality has self-evident appeal.

On the other hand, it is wise to keep in mind that these reputational ratings are measures of perceived program quality rather than of "quality" in some ideal or absolute sense. What this means is that, just as for all of the more objective measures, the reputational ratings represent only a partial view of what most of us would consider quality to be; hence, they must be kept in careful perspective.

Some critics may argue that such ratings are positively misleading because of a variety of methodological artifacts or because they are supplied by "judges" who often know very little about the programs they are rating. The committee has conducted the survey in a way that permits the empirical examination of a number of the alleged artifacts and, although our analysis is by no means exhaustive, the general conclusion is that their effects are slight.

Among the criticisms of reputational ratings from prior studies are some that represent a perspective that may be misguided. This perspective assumes that one asks for ratings in order to find out what "quality" really is and that to the degree that the ratings miss the mark of "quintessential quality," they are unreal, although the quality that they attempt to measure is real. What this perspective misses is the reality of quality and the fact that impressions of quality, if widely shared, have an imposing reality of their own and therefore are worth knowing about in their own right. After all, these perceptions govern a large-scale system of traffic around the nation's graduate institutions--for example, when undergraduate students seek the advice of professors concerning graduate programs that they might attend. It is possible that some professors put in this position disqualify themselves on grounds that they are not well informed about the relative merits of the programs being considered. Most faculty members, however, surely attempt to be helpful on the basis of impressions gleaned from their professional experience, and these assessments are likely to have major impact on student decision-making. In short, the impressions are real and have very real effects not only on students shopping for graduate schools but also on other flows, such as jobseeking young faculty and the distribution of research resources. At the very least, the survey results provide a snapshot of these impressions from discipline to discipline. Although these impressions may be far from ideally informed, they certainly show a strong degree of consensus within each discipline, and it seems safe to assume that they are more than passingly related to what a majority of keen observers might agree program quality is all about.

COMPARISON WITH RESULTS OF THE ROOSE-ANDERSEN STUDY

An analysis of the response to the committee's survey would not be complete without comparing the results with those obtained in the survey by Roose and Andersen 12 years earlier. Although there are obvious similarities in the two surveys, there are also some important differences that should be kept in mind in examining individual program ratings of the scholarly quality of faculty. Already mentioned in this chapter is the inclusion, on the form sent to 90 percent of the sample members in the committee's survey, of the names and academic ranks of faculty and the numbers of doctoral graduates in the previous five years. Other significant changes in the committee's form are the identification of the university department or academic unit in which each program may be found, the restriction of requesting evaluators to make judgments about no more than 50 research-doctorate programs in their discipline, and the presentation of these programs in random sequence on each survey form. The sampling frames used in the two surveys also differ. The sample selected in the earlier study included only individuals who had been nominated by the participating universities, while more than one-fourth of the sample in the committee's survey were chosen at random from full faculty lists. (Except for this difference the samples were quite similar--i.e., in terms of the number of evaluators in each discipline and the fraction of senior scholars.[15])

Several dissimilarities in the coverage of the Roose-Andersen and this committee's reputational assessments should be mentioned. The former included a total of 130 institutions that had awarded at least 100 doctoral degrees in two or more disciplines during the FY1958-67 period. The institutional coverage in the committee's assessment was based on the number of doctorates awarded in each discipline (as described in Chapter I) and covered a total population of 228 universities. Most of the universities represented in the present study but not the earlier one are institutions that offered research-doctorate programs in a limited set of disciplines. In the Roose-Andersen study, programs in the same seven social and behavioral science disciplines were rated: anthropology, economics, geography, history, political science, psychology, and sociology. Finally, in the Roose-Andersen study only one set of ratings was compiled from each institution represented in a discipline, whereas in the committee's survey separate ratings were requested if a university offered more than one research-doctorate program in a given discipline. The consequences of these differences in survey coverage are quite apparent: in the committee's survey, evaluations were requested for a total of 639 research-doctorate programs in the social and behavioral sciences, compared with 515 programs in the Roose-Andersen study.

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[15] For a description of the sample group used in the earlier study, see Roose and Andersen, pp. 28-31.

Figures 10.1-10.7 plot the mean ratings of scholarly quality of faculty in programs included in both surveys; sets of ratings are graphed for 38 programs in anthropology, 71 in economics, 31 in geography, 79 in history, 61 in political science, 103 in psychology, and 65 in sociology. Since in the Roose-Andersen study programs were identified by institution and discipline (but not by department), the matching of results from this survey with those from the committee's survey is not precise. For universities represented in the latter survey by more than one program in a particular discipline, the mean rating for the program with the largest number of graduates (measure 02) is the only one plotted here. Although the results of both surveys are reported on identical scales, some caution must be taken in interpreting differences in mean ratings a program received in the two evaluations. It is impossible to estimate what effect all of the differences described above may have had on the results of the two surveys. Furthermore, one must remember that the reported scores are based on the opinions of different groups of faculty members and were provided at different time periods. In 1969, when the Roose-Andersen survey was conducted, graduate departments in most universities were still expanding and not facing the enrollment and budget reductions that many departments have had to deal with in recent years. Consequently, a comparison of the overall findings from the two surveys tells us nothing about how much graduate education has improved (or declined) in the past decade. Nor should the reader place much stock in any small differences in the mean ratings that a particular program may have received in the two surveys. On the other hand, it is of particular interest to note the high correlations between the results of the evaluations. For programs in anthropology, economics, history, political science, and psychology, the correlation coefficients range between .90 and .94; in geography and sociology the coefficients are .79 and .86, respectively. The extraordinarily high correlations found in five of the seven disciplines may suggest to some readers that reputational standings of programs in these disciplines have changed very little in the last decade. However, differences are apparent for some institutions. Also, one must keep in mind that the correlations are based on the reputational ratings of only 70 percent of the programs evaluated in this assessment in these disciplines and do not take into account the emergence of many new programs that did not exist or were too small to be rated in the Roose-Andersen study.

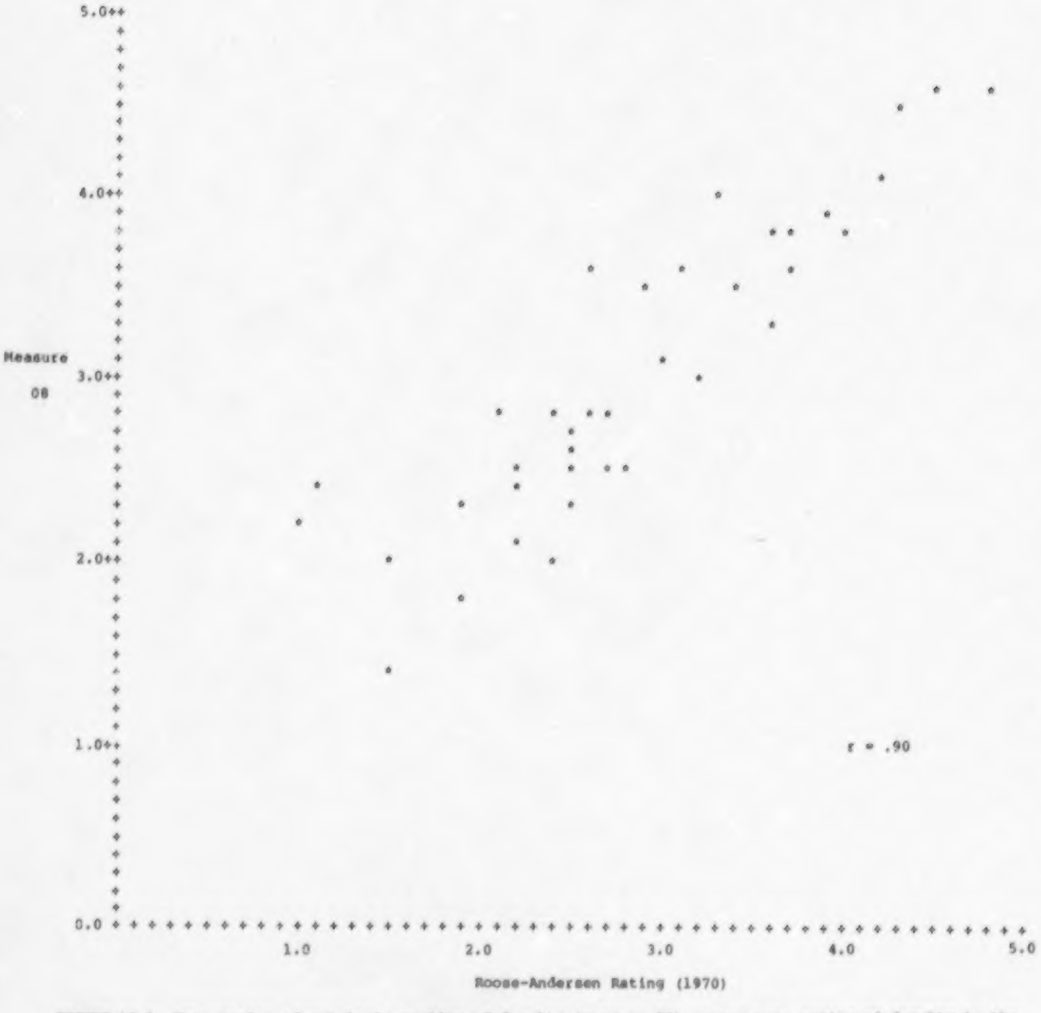

FIGURE 10.1 Mean rating of scholarly quality of faculty (measure 08) versus mean rating of faculty in the Roose-Andersen study--38 programs in anthropology.

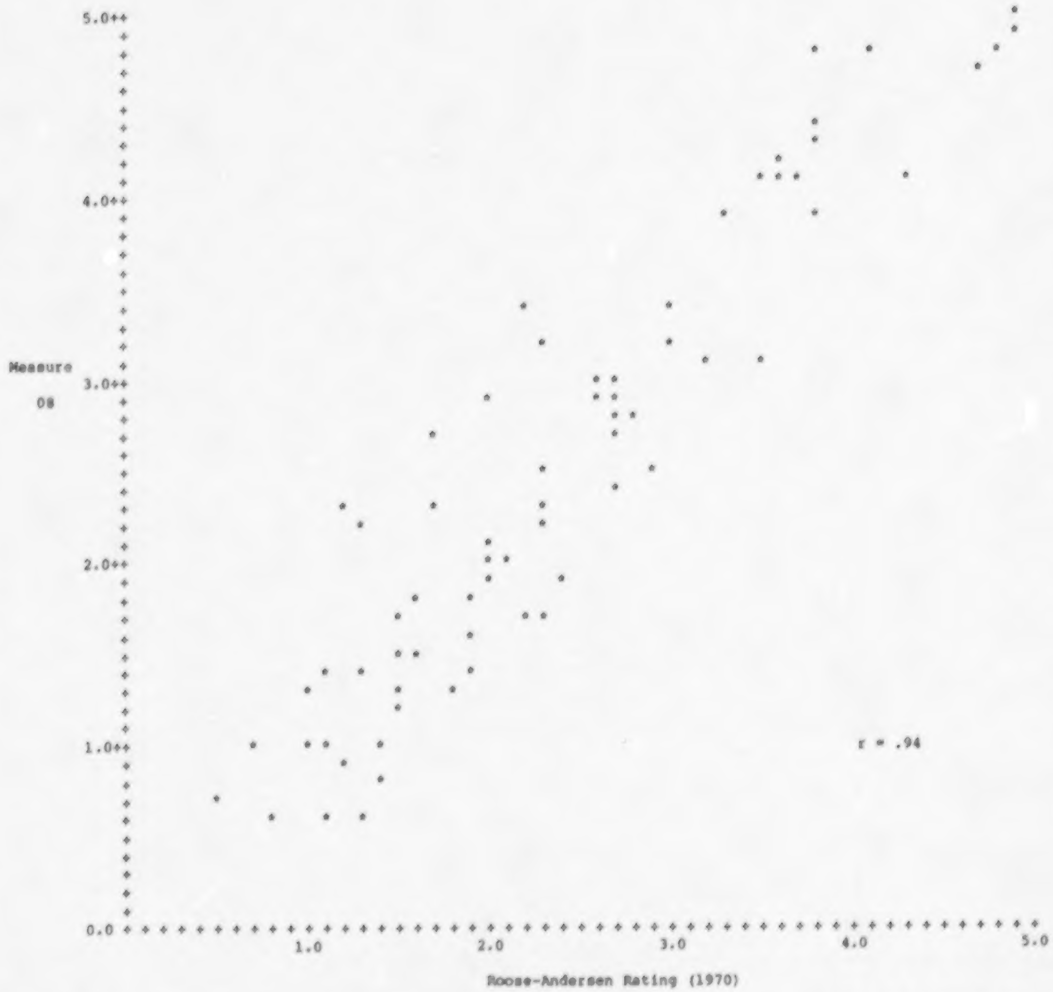

FIGURE 10.2 Mean rating of scholarly quality of faculty (measure 08) versus mean rating of faculty in the Roose-Andersen study--71 programs in economics.

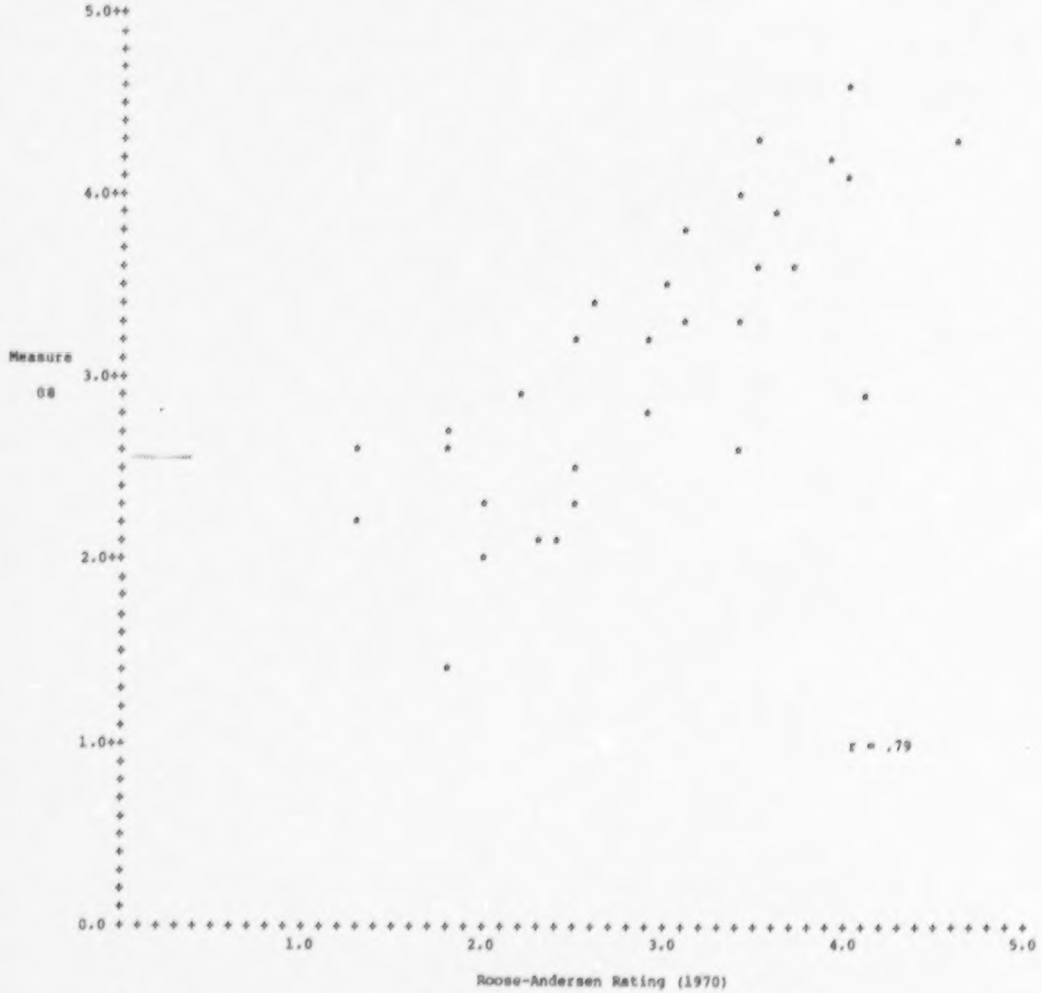

FIGURE 10.3 Mean rating of scholarly quality of faculty (measure 08) versus mean rating of faculty in the Roose-Andersen study--31 programs in geography.

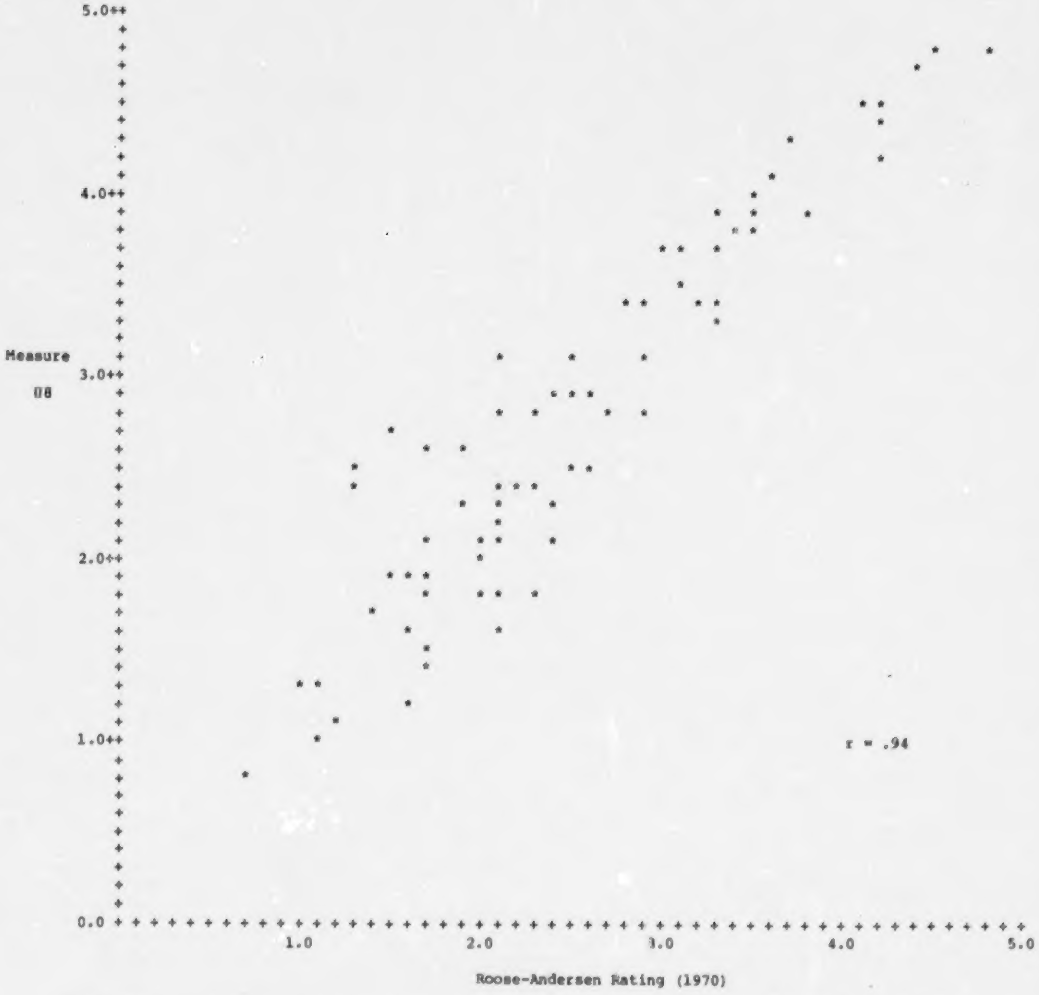

FIGURE 10.4 Mean rating of scholarly quality of faculty (measure 08) versus mean rating of faculty in the Roose-Andersen study--79 programs in history.

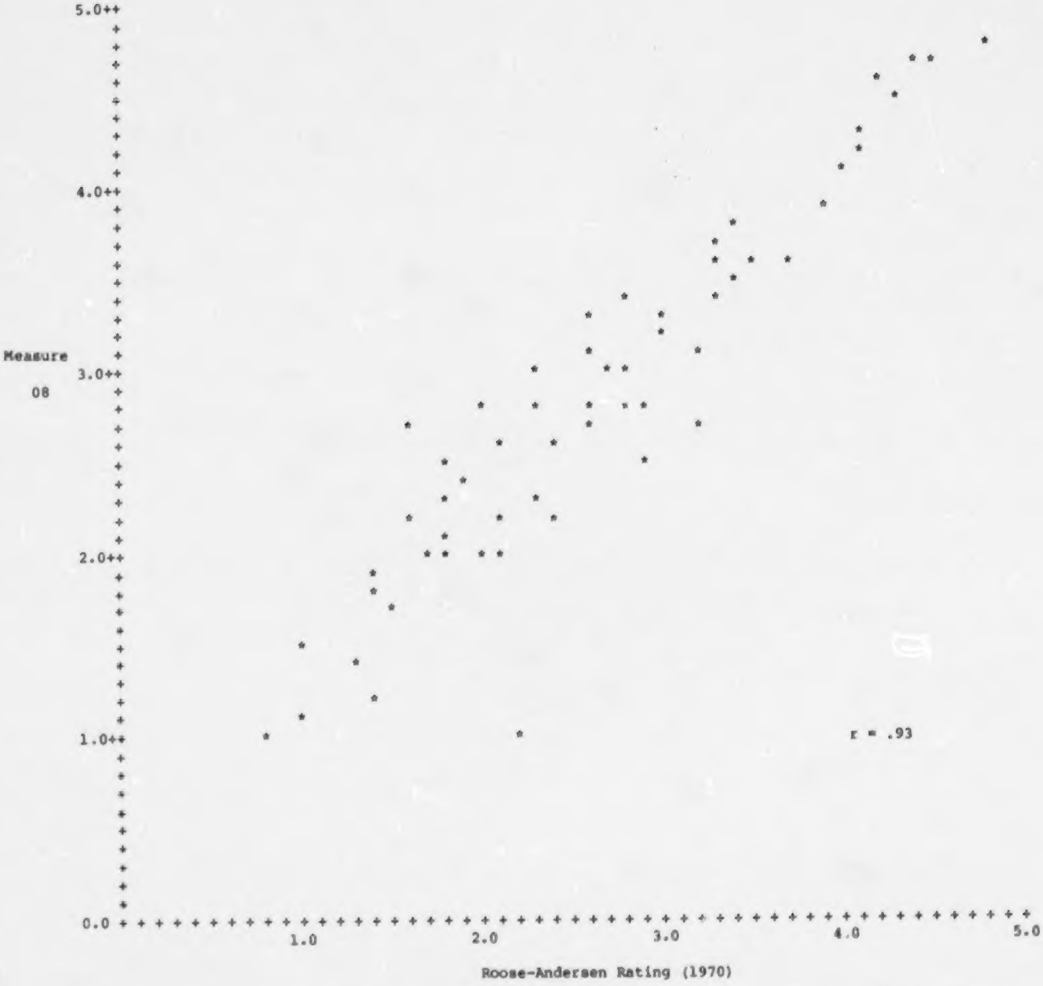

FIGURE 10.5 Mean rating of scholarly quality of faculty (measure 08) versus mean rating of faculty in the Roose-Andersen study--61 programs in political science.

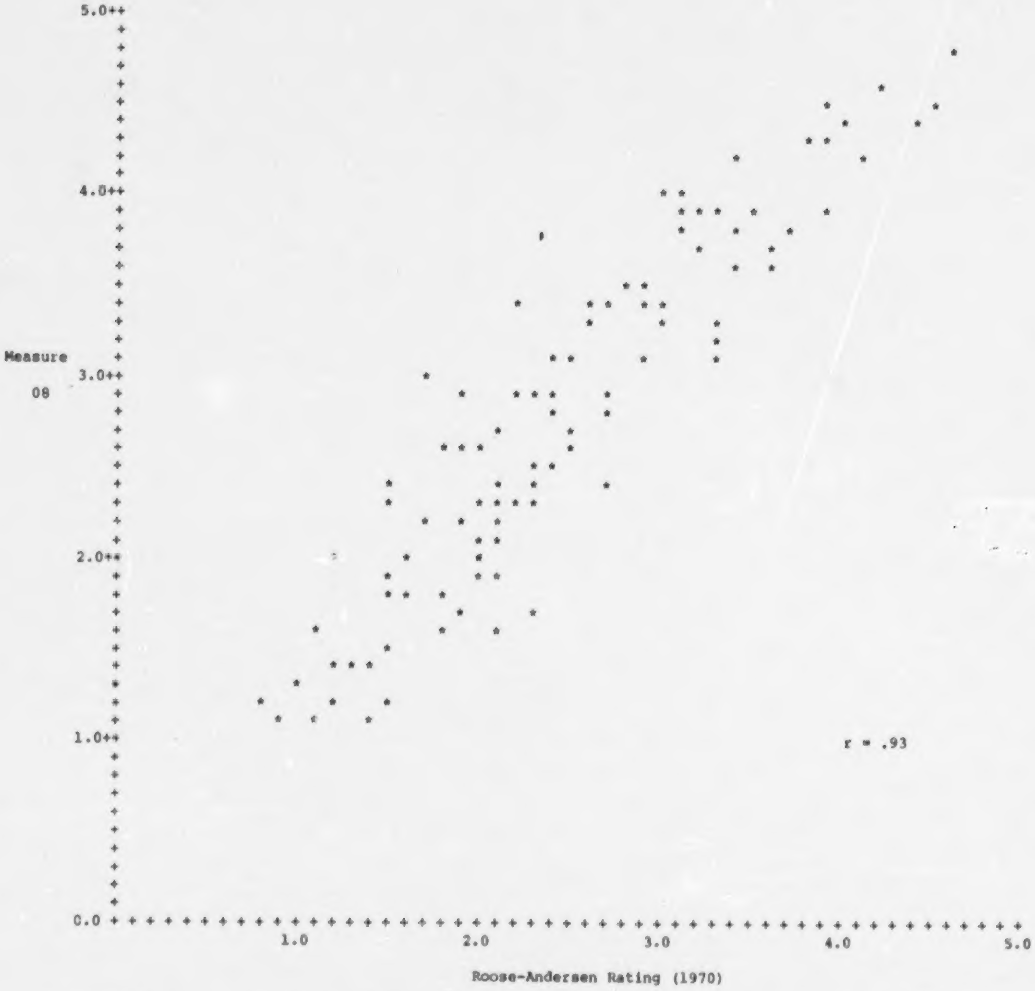

FIGURE 10.6 Mean rating of scholarly quality of faculty (measure 08) versus mean rating of faculty in the Roose-Andersen study--103 programs in psychology.

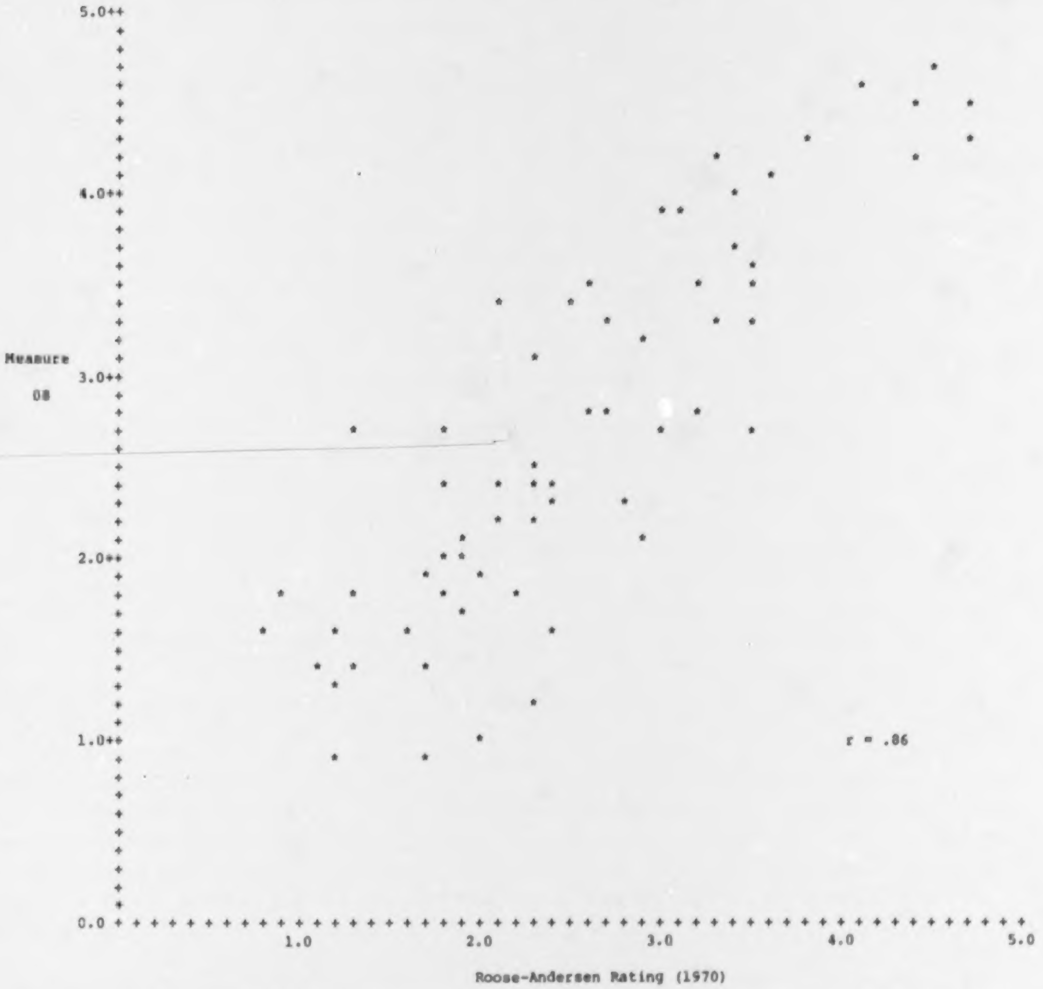

FIGURE 10.7 Mean rating of scholarly quality of faculty (measure 08) versus mean rating of faculty in the Roose-Andersen study--65 programs in sociology.

FUTURE STUDIES

One of the most important objectives in undertaking this assessment was to test new measures not used extensively in past evaluations of graduate programs. Although the committee believes that it has been successful in this effort, much more needs to be done. First and foremost, studies of this kind should be extended to cover other types of programs and other disciplines not included in this effort. As a consequence of budgeting limitations, the committee had to restrict its study to 32 disciplines, selected on the basis of the number of doctorates awarded in each. A multidimensional assessment of research-doctorate programs in many important disciplines not included among these 32 should be of great value to the academic community. Consideration should also be given to embarking on evaluations of programs offering other types of graduate and professional degrees. As a matter of fact, plans for including master's-degree programs in this assessment were originally contemplated, but because of a lack of available information about the resources and graduates of programs at the master's level, it was decided to focus on programs leading to the research doctorate.

Perhaps the most debated issue the committee has had to address concerned which measures should be reported in this assessment. In fact, there is still disagreement among some of its members about the relative merits of certain measures, and the committee fully recognizes a need for more reliable and valid indices of the quality of graduate programs. First on a list of needs is more precise and meaningful information about the product of research-doctorate programs--the graduates. For example, what fraction of the program graduates have gone on to be productive investigators--either in the academic setting or in government and industrial laboratories? What fraction have gone on to become outstanding investigators--as measured by receipt of major prizes, membership in academies, and other such distinctions? How do program graduates compare with regard to their publication records? Also desired might be measures of the quality of the students applying for admittance to a graduate program (e.g., Graduate Record Examination scores, undergraduate grade point averages). If reliable data of this sort were made available, they might provide a useful index of the reputational standings of programs, from the perspective of graduate students.

A number of alternative measures relevant to the quality of program faculty were considered by the committee but not included in the assessment because of the associated difficulties and costs of compiling the necessary data. For example, what fraction of the program faculty were invited to present papers at national meetings? What fraction had been elected to prestigious organizations/groups in their field? What fraction had received senior fellowships and other awards of distinction? In addition, it would be highly desirable to supplement the data presented on NSF, NIH, and ADAMHA research grant awards (measure 13) with data on awards from other federal agencies as well as from major private foundations.

As described in the preceding pages, the committee was able to make several changes in the survey design and procedures, but further improvements could be made. Of highest priority in this regard is the expansion of the survey sample to include evaluators from outside the academic setting. To add evaluators from nonacademic sectors would require a major effort in identifying the survey population from which a sample could be selected. Although such an effort is likely to involve considerable costs in both time and financial resources, the committee believes that the addition of evaluators from nonacademic settings would be of value in providing a different perspective to the reputational assessment and that comparisons between the ratings supplied by academic and nonacademic evaluators would be of particular interest.

Minority Statement

The inclusion of several different and independent possible measures reflecting the quality of graduate education in this report seems to us a substantial addition and a significant improvement to the previous such studies. However, we are concerned with the possibility that there are perhaps too many measures, some of which have little or no bearing on the objectives of the present study. In particular, measures 06 and 07 (on the employment plans of graduates) are not informative, have little or nothing to do with the quality of the program, and yield numbers that are not very dependable. Both measures come from data in the NRC's Survey of Earned Doctorates. Measure 06, the fraction of FY1975-79 program graduates with definite employment or study plans at time of doctorate, is vague because the "time of doctorate" may vary considerably from the time of year when, say, academic appointments are offered--and this in turn can vary substantially among institutions. This measure may be associated with the prosperity of the program, but its connection with quality is tenuous. Measure 07, the fraction of FY1975-79 program graduates planning to take positions in Ph.D.-granting universities, is even more nebulous. What is meant by "planning"? How firm are those plans? (We can't know; all there is is a check somewhere on a questionnaire.) What about the variation in quality among different Ph.D.-granting universities? It can be considerable, and such considerable differences are precisely those the whole study is attempting to measure. Such data obscure the differences. Further, measure 07 betrays the inherent bias of the present study and previous ones in that the "program graduates planning to take positions in Ph.D.-granting universities" is tacitly offered as a measure of the "goodness" of the program. In the late 1970's and 1980's nothing can be farther from the truth. The kindest evaluation of measures 06 and 07 is that they are irrelevant.

These two measures do not result from careful plans made by the committee for this study in order to find other useful new measures. Such plans were considered, but for various good reasons could not be carried out. These two particular measures just happen to be available in the vast data collected and recorded (but not critically evaluated) over the years by the Commission on Human Resources of the National Research Council. Their inclusion in this report might be explained by bureaucratic inertia, but this inclusion adds nothing to the report.

SAUNDERS MAC LANE

C. K. N. PATEL

ERNEST S. KUH

Appendixes

APPENDIX A

LETTER TO INSTITUTIONAL COORDINATORS

COMMITTEE ON AN ASSESSMENT OF QUALITY-RELATED CHARACTERISTICS
OF RESEARCH-DOCTORATE PROGRAMS IN THE UNITED STATES

Established by the Conference Board of Associated Research Councils

Office of the Staff Director / National Research Council / 2101 Constitution Avenue, N.W. / Washington, D.C. 20418

(202) 389-6552

December 5, 1980

Dear

We are pleased to learn that you have been designated to coordinate the efforts of your institution in assisting our committee with an assessment of the characteristics and effectiveness of research-doctorate programs in U.S. universities. A prospectus describing the goals and procedures for this study has already been distributed to university presidents and graduate deans. The cooperation of universities and their faculties is essential for the assessment to be carried out in an objective and accurate fashion.

The study is being conducted under the aegis of the Conference Board of Associated Research Councils and is housed administratively within the National Research Council. Financial support has been provided by the Andrew W. Mellon Foundation, the Ford Foundation, the National Science Foundation, and the National Institutes of Health. The study will examine more than 2,600 programs in 31 fields in the physical sciences, engineering, life sciences, social sciences, and humanities. Approximately 10,000 faculty members will be asked to evaluate programs in their own fields. In addition to the reputational evaluations by faculty, information will be compiled from national data banks on the achievements of both the faculty involved in each program and the program graduates.

The product of this study will be a series of reports with descriptive data on institutional programs in each of 31 fields to be covered. These reports will present several different measures of the quality-related characteristics of each program being evaluated. Some of the measures will be adjusted for program size. With the cooperation of your institution and that of other universities, we plan to produce these reports by late spring of 1982. At that time the detailed data that have

COMMITTEE MEMBERS

Lyle V. Jones, Co-Chairman
Gardner Lindzey, Co-Chairman
Paul A. Albrecht
Marcus Alexis
Robert M. Bock
Philip E. Converse
James H. M. Henderson
Ernest S. Kuh
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Nancy S. Milburn
Lincoln E. Moses
James C. Olson
Kumar Patel
Michael J. Pelczar, Jr.
Jerome B. Schneewind
Duane C. Spriestersbach
Harriet A. Zuckerman

been compiled on research-doctorate programs within your institution will be made available to you for a nominal cost. These data should prove to be quite valuable for an assessment of the particular strengths and weaknesses of individual programs at your institution.

For the past three months the committee has deliberated over what fields are to be covered in the study and which programs within each field are to be evaluated. The financial resources available limit us to an assessment of approximately 2,600 programs in 31 fields. The fields to be included have been determined on the basis of the total number of doctorates awarded by U.S. universities during the FY1976-78 period and the feasibility of identifying and evaluating comparable programs in a particular field. Within each of the 31 fields, programs which awarded more than a specified number of doctorates during the period have been designated for inclusion in the study.

For each of the programs at your institution that are to be evaluated, we ask that you furnish the names and ranks of all faculty members who participate significantly in education toward the research doctorate, along with some basic information (as indicated) about the program itself. A set of instructions and a computer-printed roster (organized by field) are enclosed. In addition, you are given an opportunity to nominate other programs at your institution that are not on the roster, but that you believe have significant distinction and should be included in our evaluation. Any program you nominate must belong in one of the 31 fields covered by the study.

The information supplied by your institution will be used for two purposes. First, a sample of the faculty members identified with each program will be selected to evaluate research-doctorate programs in their fields at other universities. The selection will be made in such a way as to ensure that all institutional programs and faculty ranks are adequately represented in each field category. Secondly, a list of names of faculty and some of the program information you supply will be provided to evaluators selected from other institutions. Thus, it is important that you provide accurate and up-to-date information. You may wish to ask department chairmen or other appropriate persons at your institution to assist in providing the information requested. If you do so, we ask that your office coordinate the effort by collecting the information on each program and sending a single package to us in the envelope provided.

We hope that you will be able to complete this request by December 15. Should you have any questions regarding our request, please call (collect) Porter Coggeshall, the study director, at (202)389-6552. Thank you for your help in this effort.

Sincerely,

Lyle V. Jones

Lyle V. Jones
Co-Chairman

Gardner Lindzey

Gardner Lindzey
Co-Chairman

INSTRUCTIONS

General Instructions

- Provided on the first page of the accompanying roster is a list of the 31 program fields to be covered in this study. Those program fields for which you are requested to furnish information have been designated with an asterisk (*).

- For every designated field there is a separate set of roster pages. Please provide all of the information requested on these pages.

- If your institution offers more than one research-doctorate program in a designated field, we ask that you copy the roster pages furnished for that field category and provide a separate set of information for each program. For example, if your university offers one doctoral program in statistics and another in biostatistics, these should be listed separately. For this purpose, programs offered by different departments (or other administative units) that are advertised as distinct programs in your catalogues would be listed separately. Do not consider different specialty areas within a department to be separate programs.

- If your institution currently does not offer a research-doctorate program in an asterisked field or if, in your judgment, a doctoral program offered fails to fit the designated field category, please so indicate on the roster pages provided for that field.

List of Faculty Members (as of December 1, 1980)

- On each program roster please provide the names of faculty members who participate significantly in doctoral education.

- Included should be individuals who (a) are members of the regular academic faculty (typically holding the rank of assistant, associate, or full professor) and (b) regularly teach doctoral students and/or serve on doctoral committees.

- Members of the faculty who are currently on leave of absence but meet the above criteria should be included.

- Visiting faculty members should not be included.

- Emeritus or adjunct faculty members (or faculty with other comparable ranks) should also be excluded unless they currently participate significantly in doctoral education.

- Members of the faculty who participate significantly in doctoral education in more than one program should be listed on the roster for each program in which they participate.

- In many instances the list of faculty for a program may be identical to an institutional list of graduate faculty.

- Faculty names should be provided in the form in which they are most likely to be recognized by colleagues in the field. We prefer that, within each academic rank, you list faculty alphabetically by last name.

Nomination of Faculty to Serve as Program Evaluators
(Column 3 of Faculty Roster)

- Please check the names of at least two faculty members in each academic rank within each program who would be available and, in your opinion, well-qualified to evaluate research-doctorate programs in their field.

- A sample of evaluators will be selected from the list of faculty you provide for each program. In selecting evaluators preference will be given to those whose names you have checked. If no names are checked, a random sample will be selected from the faculty list.

Faculty Who Do Not Hold Ph.D. Degrees From U.S. Universities
(Column 4 of Faculty Roster)

- In order to help us match the faculty names you provide with records in the Doctorate Records File (maintained by the National Research Council), we ask that you identify those faculty members who do not hold a Ph.D. or equivalent research-doctorate from a university in the United States.

- This information will be used only for the purposes of collating records and will not be released to those who are selected to evaluate your institution's programs. Nor will this information affect in any way the selection of program evaluators from your institution's faculty.

Nomination of Additional Programs

- We recognize the possibility that we may have omitted one or more research-doctorate programs at your institution that belong to (non-asterisked) fields listed on the first page of the roster and that you believe should be included in this study.

- The last two pages of the accompanying roster are provided for the nomination of an additional program. You are asked to provide the names of faculty and other information about each program you nominate. Should you decide to nominate more than one program, it will be necessary to make additional copies of these two pages of the roster.

- Please restrict your nominations to programs in your institution that you consider to be of uncommon distinction and that have awarded no fewer than two doctorates during the past two years.

- Only programs which fall under one of the 31 field categories listed on the first page of the accompanying roster will be considered for inclusion in the study.

PLEASE RETURN COMPLETED ROSTER IN
THE ENCLOSED ENVELOPE TO:

COMMITTEE ON AN ASSESSMENT OF
QUALITY-RELATED CHARACTERISTICS
OF RESEARCH-DOCTORATE PROGRAMS
NATIONAL RESEARCH COUNCIL, JH-711
2101 CONSTITUTION AVENUE, N.W.
WASHINGTON, D.C. 20418

FIELDS INCLUDED IN THE STUDY

ARTS AND HUMANITIES

* ART HISTORY
* CLASSICS
* ENGLISH LANGUAGE AND LITERATURE
* FRENCH LANGUAGE AND LITERATURE
* GERMAN LANGUAGE AND LITERATURE
  LINGUISTICS
  MUSIC
* PHILOSOPHY
* SPANISH AND PORTUGUESE LANGUAGE AND LITERATURE

BIOLOGICAL SCIENCES

* BIOCHEMISTRY
  BOTANY (INCLUDING PLANT PHYSIOLOGY, PLANT PATHOLOGY, MYCOLOGY)
* CELLULAR BIOLOGY/MOLECULAR BIOLOGY
* MICROBIOLOGY (INCLUDING IMMUNOLOGY, BACTERIOLOGY, PARASITOLOGY, VIROLOGY)
* PHYSIOLOGY (ANIMAL, HUMAN)
  ZOOLOGY

ENGINEERING

* CHEMICAL ENGINEERING
* CIVIL ENGINEERING
* ELECTRICAL ENGINEERING
* MECHANICAL ENGINEERING

PHYSICAL SCIENCES

* CHEMISTRY
* COMPUTER SCIENCES
* GEOSCIENCES (INCLUDING GEOLOGY, GEOCHEMISTRY, GEOPHYSICS, GENL EARTH SCI)
* MATHEMATICS
* PHYSICS (EXCLUDING ASTRONOMY, ASTROPHYSICS)
  STATISTICS (INCLUDING BIOSTATISTICS)

SOCIAL AND BEHAVIORAL SCIENCES

* ANTHROPOLOGY
* ECONOMICS
* HISTORY
* POLITICAL SCIENCE
* PSYCHOLOGY
* SOCIOLOGY

* DESIGNATES FIELDS FOR WHICH YOU ARE REQUESTED TO PROVIDE INFORMATION ON RESEARCH-DOCTORATE PROGRAMS IN YOUR INSTITUTION. (SEE INSTRUCTION SHEET REGARDING NOMINATION OF ADDITIONAL PROGRAMS TO BE INCLUDED IN THE STUDY) .

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**************************************************
***                               - PART A  ***
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```

PLEASE ANSWER EACH OF THE FOLLOWING QUESTIONS ABOUT THE RESEARCH-DOCTORATE PROGRAM

IN ______________________________

(1) WHAT IS THE NAME OF THE DEPARTMENT (OR EQUIVALENT ACADEMIC UNIT) IN WHICH THIS RESEARCH-DOCTORATE PROGRAM IS OFFERED ?

....

(2) HOW MANY PH.D.'S (OR EQUIVALENT RESEARCH-DOCTORATES) HAVE BEEN AWARDED IN THE PROGRAM IN EACH OF THE LAST FIVE ACADEMIC YEARS ?

1975-76 ....

1976-77 ....

1977-78 ....

1978-79 ....

1979-80 ....

(3) APPROXIMATELY HOW MANY FULL-TIME AND PART-TIME GRADUATE STUDENTS ENROLLED IN THE PROGRAM AT THE PRESENT TIME (FALL 1980) INTEND TO EARN DOCTORATES ?

FULL-TIME STUDENTS ....

PART-TIME STUDENTS ....

TOTAL ....

(4) IN APPROXIMATELY WHAT YEAR WAS THIS RESEARCH-DOCTORATE PROGRAM INITIATED ? (IF PROGRAM WAS DISCONTINUED AND SUBSEQUENTLY REINSTATED, PLEASE GIVE YEAR IT WAS REINSTATED) .

....

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*** _                               - PART B ***
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	(1) LIST BELOW ALL_FACULTY_WHO PARTICIPATE_SIGNIFICANTLY_IN DOCTORAL_EDUCATION IN THIS PROGRAM (SEE INSTRUCTIONS SHEET). PLEASE PRINT OR TYPE NAMES_IN FOLLOWING FORMAT: EXAMPLE: MARY A. JONES A. B. SMITH, JR.	(2) INDICATE THE ACADEMIC RANK OF EACH FACULTY MEMBER (PROF., ASSOC. PROF., ASST. PROF., ETC.).	(3) CHECK BELOW AT LEAST 2 FACULTY IN EACH RANK AVAILABLE AND WELL-QUALIFIED TO EVALUATE OTHER PROGRAMS (SEE INSTRUCTIONS SHEET).	(4) CHECK BELOW ANY FACULTY WHO DO NOT HOLD A PH.D. OR OTHER RESEARCH-DOCTORATE FROM A UNIVERSITY IN THE U.S. (SEE INSTRUCTIONS SHEET).
01		..	( )	( )
02		..	( )	( )
03		..	( )	( )
04		..	( )	( )
05		..	( )	( )
06		..	( )	( )
07		..	( )	( )
08		..	( )	( )
09		..	( )	( )
10		..	( )	( )
11		..	( )	( )
12		..	( )	( )
13		..	( )	( )
14		..	( )	( )
15		..	( )	( )
16		..	( )	( )
17		..	( )	( )
18		..	( )	( )
19		..	( )	( )
20		..	( )	( )

(PART B CONTINUED ON NEXT PAGE)

APPENDIX B

SURVEY OF EARNED DOCTORATES

(Conducted by the National Research Council under the sponsorship of the National Science Foundation, the Department of Education, the National Institutes of Health, and the National Endowment for the Humanities.)

This annual survey of new recipients of Ph.D. or equivalent research doctorates in all fields of learning contains information describing their demographic characteristics, educational background, graduate training, and postgraduation plans. The source file includes nearly complete data from all 1958-81 doctorate recipients and partial information for all 1920-57 doctoral graduates.

NSF Form 558 1977
OMB No. 99-R0290
Approval Expires June 30, 1979

SURVEY OF EARNED DOCTORATES

This form is to be returned to the GRADUATE DEAN, for forwarding to .... Board on Human-Resource Data and Analyses
Commission on Human Resources
National Research Council
2101 Constitution Avenue, Washington, D. C. 20418

Please print or type.

A. **Name in full:** .... (9-30)
(Last Name) (First Name) (Middle Name)

Cross Reference: Maiden name or former name legally changed .... (31)

B. **Permanent address through which you could always be reached:** (Care of, if applicable) ....

....
(Number) (Street) (City)

....
(State) (Zip Code) (Or Country if not U.S.)

C. **U.S. Social Security Number:** ___ ___ ___ - ___ ___ - ___ ___ ___ ___ (32-40)

D. **Date of birth:** .... **Place of birth:** ....
(41-45) (Month) (Day) (Year) (46-47) (State) (Or C[illegible]y if not U.S.)

E. **Sex:** 1 ☐ Male 2 ☐ Female (48)

F. **Marital status:** 1 ☐ Married 2 ☐ Not married (including widowed, divorced) (49)

G. **Citizenship:** 0 ☐ U.S. native 2 ☐ Non U.S., Immigrant (Permanent Resident)
1 ☐ U.S. naturalized 3 ☐ Non-U.S., Non-Immigrant (Temporary Resident) (50)
If Non-U.S., indicate country of present citizenship .... (51-52)

H. **Racial or ethnic group:** (Check all that apply.) *A person having origins in —*
0 ☐ American Indian or Alaskan Native ......any of the original peoples of North America, and who maintain cultural identification through tribal affiliation or community recognition.
1 ☐ Asian or Pacific Islander ....any of the original peoples of the Far East, Southeast Asia, the Indian Subcontinent, or the Pacific Islands. This area includes, for example, China, Japan, Korea, the Philippine Islands, and Samoa.
2 ☐ Black, not of Hispanic Origin ....any of the black racial groups of Africa.
3 ☐ White, not of Hispanic Origin ....any of the original peoples of Europe, North Africa, or the Middle East.
4 ☐ Hispanic ....Mexican, Puerto Rican, Central or South American, or other Spanish culture or origins, regardless of race. (53-55)

I. **Number of dependents:** Do not include yourself. (Dependent = someone receiving at least one half of his or her support from you) ....(56)

J. **U.S. veteran status:** 0 ☐ Veteran 1 ☐ On active duty 2 ☐ Non-veteran or not applicable (57)

EDUCATION

K. **High school last attended:** .... (58-59)
(School Name) (City) (State)

Year of graduation from high school: .... (60-61)

L. **List in the table below all collegiate and graduate institutions you have attended including 2-year colleges. List chronologically, and include your doctoral institution as the last entry.**

Institution Name	Location	Years Attended		Major Field		Minor Field	Degree (if any)		
				Use Specialties List			Title of Degree	Granted	
		From	To	Name	Number	Number		Mo.	Yr.

M. **Enter below the title of your doctoral dissertation and the most appropriate classification number and field. If a project report or a musical or literary composition (not a dissertation) is a degree requirement, please check box.** ☐ (44)

Title ....
....
....

Classify using Specialties List
Number .... Name of field ....

N. **Name the department (or interdisciplinary committee, center, institute, etc.) and school or college of the university which supervised your doctoral program:** ....
(Department/Institute/Committee/Program) (School)

O. **Name of your dissertation adviser:** ....
(Last Name) (First Name) (Middle Initial)

continued on next page

SURVEY OF EARNED DOCTORATES, Cont.

P. Please enter a "1" beside your primary source of support during graduate study. Enter a "2" beside your secondary source of support during graduate study. Check all other sources from which support was received.

58 ___ NSF Fellowship
59 ___ NSF Traineeship
60 ___ NIH Fellowship
61 ___ NIH Traineeship
62 ___ NDEA Fellowship
63 ___ Other HEW
64 ___ AEC/ERDA Fellowship
65 ___ NASA Traineeship
66 ___ GI Bill
67 ___ Other Federal support (specify) ....
68 ___ Woodrow Wilson Fellowship
69 ___ Other U.S. national fellowship (specify) ....
70 ___ University Fellowship
71 ___ Teaching Assistantship
72 ___ Research Assistantship
73 ___ Educational fund of industrial or business firm
74 ___ Other institutional funds (specify) ....
75 ___ Own earnings
76 ___ Spouse's earnings
77 ___ Family contributions
78 ___ Loans (NDSL direct)
79 ___ Other loans
80 ___ Other (specify) ....

Q. Please check the space which most fully describes your status during the year immediately preceding the doctorate.

0 ☐ Held fellowship
1 ☐ Held assistantship
2 ☐ Held own research grant
3 ☐ Not employed
4 ☐ Part-time employed

Full-time Employed in: (Other than 0, 1, 2)
5 ☐ College or university, teaching
6 ☐ College or university, non-teaching
7 ☐ Elem. or sec. school, teaching
8 ☐ Elem. or sec. school, non-teaching
9 ☐ Industry or business
(11) ☐ Other (specify) ....

(12) ☐ Any other (specify) .... (9)

R. How many years (full-time equivalent basis) of professional work experience did you have prior to the doctorate? (include assistantships as professional experience) .... (10-11)

POSTGRADUATION PLANS

S. How well defined are your postgraduation plans?
0 ☐ Have signed contract or made definite commitment
1 ☐ Am negotiating with a specific organization, or more than one
2 ☐ Am seeking appointment but have no specific prospects
3 ☐ Other (specify) .... (12)

T. What are your immediate postgraduation plans?
0 ☐ Postdoctoral fellowship?
1 ☐ Postdoctoral research associateship?
2 ☐ Traineeship?
3 ☐ Other study (specify) ....
} Go to Item "U"
4 ☐ Employment (other than 0, 1, 2, 3)
5 ☐ Military service?
6 ☐ Other (specify) .... (13)
} Go to Item "V"

U. If you plan to be on a postdoctoral fellowship, associateship, traineeship or other study

What will be the field of your postdoctoral study?
Classify using Specialties List.
Number .... Field .... (14-16)

What will be the primary source of support?
0 ☐ U.S. Government
1 ☐ College or university
2 ☐ Private foundation
3 ☐ Nonprofit, other than private foundation
4 ☐ Other (specify) .... (17)
6 ☐ Unknown
Go to Item "W"

V. If you plan to be employed, enter military service, or other – What will be the type of employer?
0 ☐ 4-year college or university other than medical school
1 ☐ Medical school
2 ☐ Jr. or community college
3 ☐ Elem. or sec. school
4 ☐ Foreign government
5 ☐ U.S. Federal government
6 ☐ U.S. state government
7 ☐ U.S. local government
8 ☐ Nonprofit organization
9 ☐ Industry or business
(11) ☐ Self-employed
(12) ☐ Other (specify) .... (18)

Indicate *primary* work activity with "1" in appropriate box; *secondary* work activity (if any) with "2" in appropriate box.
0 ☐ Research and development
1 ☐ Teaching
2 ☐ Administration
3 ☐ Professional services to individuals
5 ☐ Other (specify) .... (19-20)

In what field will you be working?
Please enter number from Specialties List .... (21-23)

Go to Item "W"

W. What is the name and address of the organization with which you will be associated?

.... (Name of Organization)

.... (Street) .... (City, State) (Or Country if not U.S.) (24-29)

BACKGROUND INFORMATION

X. Please indicate, by circling the highest grade attained, the education of

your father:	none	1 2 3 4 5 6 7 8	9 10 11 12	1 2 3 4	MA, MD PhD	Postdoctoral	(30)
		Elementary school	High school	College	Graduate		
your mother	none	1 2 3 4 5 6 7 8	9 10 11 12	1 2 3 4	MA, MD PhD	Postdoctoral	(31)
	0	1 2 3	4 5	6 7	8 9	(11)	

Signature .... Date completed .... (32-34)

APPENDIX C

LETTER TO EVALUATORS

COMMITTEE ON AN ASSESSMENT OF QUALITY-RELATED CHARACTERISTICS
OF RESEARCH-DOCTORATE PROGRAMS IN THE UNITED STATES

Established by the Conference Board of Associated Research Councils

Office of the Staff Director / National Research Council / 2101 Constitution Avenue, N.W. / Washington, D.C. 20418

April 14, 1981

Dear

As you may already know, our committee has undertaken an assessment of research-doctorate programs in U.S. universities. The study is examining approximately 2,650 programs in 31 fields in the arts and humanities, biological sciences, engineering, physical and mathematical sciences, and social sciences. A study prospectus is provided on the reverse of this page. You have been selected from a faculty list furnished by your institution to evaluate programs offering research-doctorates in the field of Psychology.

On the first page of the attached form is a list of the 150 programs that are being evaluated in this field. These programs produce more than 90 percent of the doctorate recipients in the field. In order to keep the task manageable, you are being asked to consider a randomly selected subset of 50 of these programs. These are designated with an asterisk in the list on the next page and are presented in random sequence on the evaluation sheets that follow. Please read the accompanying instructions carefully before attempting your evaluations.

We ask that you complete the attached survey form and return it in the enclosed envelope within the next three weeks. The evaluations you and your colleaques render will constitute an important component of this study. Your prompt attention to this request will be very much appreciated by our committee.

Sincerely,

Gardner Lindzey

Lyle Jones
For the Study Committee

Enclosures

COMMITTEE MEMBERS

Lyle V. Jones, Co-Chairman
Gardner Lindzey, Co-Chairman
Paul A. Albrecht
Marcus Alexis
Robert M. Bock
Philip E. Converse
James H. M. Henderson
Ernest S. Kuh
Winfred P. Lehmann
Saunders Mac Lane
Nancy S. Milburn
Lincoln E. Moses
James C. Olson
Kumar Patel
Michael J. Pelczar, Jr.
Jerome B. Schneewind
Duane C. Spriestersbach
Harriet A. Zuckerman

RESEARCH-DOCTORATE PROGRAMS IN THE FIELD OF PSYCHOLOGY
(* DESIGNATES THE PROGRAMS WHICH YOU ARE ASKED TO EVALUATE ON THE FOLLOWING PAGES.)

INSTITUTION - DEPARTMENT/ACADEMIC UNIT

ADELPHI UNIVERSITY - PSYCHOLOGY
UNIVERSITY OF ALABAMA, TUSCALOOSA - EXPERIMENTAL AND CLINICAL PSYCHOLOGY
ARIZONA STATE UNIVERSITY, TEMPE - PSYCHOLOGY
UNIVERSITY OF ARIZONA, TUCSON - PSYCHOLOGY
UNIVERSITY OF ARKANSAS, FAYETTEVILLE - PSYCHOLOGY
AUBURN UNIVERSITY - PSYCHOLOGY
BAYLOR UNIVERSITY, WACO - PSYCHOLOGY
* ROSEMEAD GRAD SCH OF PROF PSYCHOLOGY - SCHOOL OF PROFESSIONAL PSYCHOLOGY
* BOSTON UNIVERSITY - PSYCHOLOGY
BOWLING GREEN STATE UNIVERSITY - PSYCHOLOGY
BRANDEIS UNIVERSITY - PSYCHOLOGY
* BRIGHAM YOUNG UNIVERSITY - PSYCHOLOGY
* BROWN UNIVERSITY - PSYCHOLOGY
* BRYN MAWR COLLEGE - PSYCHOLOGY
* CALIF SCH OF PROF PSYCHOLOGY, SAN DIEGO - PSYCHOLOGY
* CALIF SCH OF PROF PSYCHOLOGY, BERKELEY - PSYCHOLOGY
UNIVERSITY OF CALIFORNIA, BERKELEY - PSYCHOLOGY
UNIVERSITY OF CALIFORNIA, DAVIS - PSYCHOLOGY
UNIVERSITY OF CALIFORNIA, IRVINE - PSYCHOBIOLOGY (SCHOOL OF BIOLOGICAL SCIENCES)
UNIVERSITY OF CALIFORNIA, IRVINE - COGNITIVE SCI/SOCIAL RELATIONS (SCHOOL OF SOCIAL SCI)
UNIVERSITY OF CALIFORNIA, LOS ANGELES - PSYCHOLOGY
* UNIVERSITY OF CALIFORNIA, RIVERSIDE - PSYCHOLOGY
* UNIVERSITY OF CALIFORNIA, SAN DIEGO - PSYCHOLOGY
UNIVERSITY OF CALIFORNIA, SANTA BARBARA - PSYCHOLOGY
CARNEGIE-MELLON UNIVERSITY - PSYCHOLOGY AND EDUCATION
* CASE WESTERN RESERVE UNIVERSITY - CLINICAL PSYCHOLOGY
* CATHOLIC UNIVERSITY OF AMERICA - PSYCHOLOGY
UNIVERSITY OF CHICAGO - BEHAVIORAL SCIENCES
* UNIVERSITY OF CINCINNATI - PSYCHOLOGY
CUNY, THE GRADUATE SCHOOL - PSYCHOLOGY
* CLAREMONT GRADUATE SCHOOL - PSYCHOLOGY
CLARK UNIVERSITY - PSYCHOLOGY
COLORADO STATE UNIVERSITY, FT COLLINS - PSYCHOLOGY
UNIVERSITY OF COLORADO, BOULDER - PSYCHOLOGY
COLUMBIA UNIV-GRAD SCHOOL OF ARTS & SCI - PSYCHOLOGY
TEACHERS COLLEGE, COLUMBIA UNIV - PSYCHOLOGY
* UNIVERSITY OF CONNECTICUT, STORRS - PSYCHOLOGY
CORNELL UNIVERSITY, ITHACA - PSYCHOLOGY
UNIVERSITY OF DELAWARE, NEWARK - PSYCHOLOGY
* UNIVERSITY OF DENVER - PSYCHOLOGY
DE PAUL UNIVERSITY - PSYCHOLOGY
UNIVERSITY OF DETROIT - PSYCHOLOGY
DUKE UNIVERSITY - PSYCHOLOGY
EMORY UNIVERSITY - PSYCHOLOGY
* FORDHAM UNIVERSITY - PSYCHOLOGY
FULLER THEOLOGICAL SEMINARY (PASADENA) - PSYCHOLOGY
* GEORGE WASHINGTON UNIVERSITY - PSYCHOLOGY
* GEORGIA STATE UNIVERSITY, ATLANTA - PSYCHOLOGY
UNIVERSITY OF GEORGIA, ATHENS - PSYCHOLOGY
HARVARD UNIVERSITY - PSYCHOLOGY AND SOCIAL RELATIONS
* UNIVERSITY OF HAWAII - PSYCHOLOGY
HOFSTRA UNIVERSITY - PSYCHOLOGY
* UNIVERSITY OF HOUSTON - PSYCHOLOGY
ILLINOIS INSTITUTE OF TECHNOLOGY - PSYCHOLOGY
* UNIV OF ILLINOIS AT URBANA-CHAMPAIGN - PSYCHOLOGY
UNIVERSITY OF ILLINOIS, CHICAGO CIRCLE - PSYCHOLOGY
INDIANA UNIVERSITY, BLOOMINGTON - PSYCHOLOGY
IOWA STATE UNIVERSITY, AMES - PSYCHOLOGY
UNIVERSITY OF IOWA, IOWA CITY - PSYCHOLOGY
* JOHNS HOPKINS UNIVERSITY - PSYCHOLOGY
* KANSAS STATE UNIVERSITY, MANHATTAN - PSYCHOLOGY
* UNIVERSITY OF KANSAS - HUMAN DEVELOPMENT AND FAMILY LIFE
UNIVERSITY OF KANSAS - PSYCHOLOGY
KENT STATE UNIVERSITY - PSYCHOLOGY
UNIVERSITY OF KENTUCKY - PSYCHOLOGY
LONG ISLAND UNIVERSITY, THE BROOKLYN CENTER - PSYCHOLOGY
LOUISIANA STATE UNIVERSITY, BATON ROUGE - PSYCHOLOGY
* UNIVERSITY OF LOUISVILLE - PSYCHOLOGY
LOYOLA UNIVERSITY OF CHICAGO - PSYCHOLOGY
UNIVERSITY OF MARYLAND, COLLEGE PARK - PSYCHOLOGY
MASSACHUSETTS INSTITUTE OF TECHNOLOGY - PSYCHOLOGY
* UNIVERSITY OF MASSACHUSETTS, AMHERST - PSYCHOLOGY
MIAMI UNIVERSITY (OHIO) - PSYCHOLOGY

* UNIVERSITY OF MIAMI (FLORIDA) - PSYCHOLOGY
MICHIGAN STATE UNIVERSITY, EAST LANSING - PSYCHOLOGY
UNIVERSITY OF MICHIGAN, ANN ARBOR - PSYCHOLOGY
UNIVERSITY OF MINNESOTA - PSYCHOLOGY
* UNIVERSITY OF MISSISSIPPI, OXFORD - PSYCHOLOGY
UNIVERSITY OF MISSOURI, COLUMBIA - PSYCHOLOGY
* UNIVERSITY OF MONTANA, MISSOULA - PSYCHOLOGY
* UNIVERSITY OF NEBRASKA, LINCOLN - PSYCHOLOGY
UNIVERSITY OF NEW HAMPSHIRE - PSYCHOLOGY
UNIVERSITY OF NEW MEXICO, ALBUQUERQUE - PSYCHOLOGY
NEW SCHOOL FOR SOCIAL RESEARCH (NYC) - PSYCHOLOGY
NEW YORK UNIVERSITY - PSYCHOLOGY
UNIVERSITY OF NORTH CAROLINA, CHAPEL HILL - PSYCHOLOGY
NORTH CAROLINA STATE UNIVERSITY, RALEIGH - PSYCHOLOGY
UNIVERSITY OF NORTH CAROLINA, GREENSBORO - PSYCHOLOGY
UNIVERSITY OF NORTH DAKOTA, GRAND FORKS - PSYCHOLOGY
NORTH TEXAS STATE UNIVERSITY, DENTON - PSYCHOLOGY
NORTHEASTERN UNIVERSITY - PSYCHOLOGY
* NORTHERN ILLINOIS UNIVERSITY, DE KALB - PSYCHOLOGY
NORTHWESTERN UNIVERSITY - PSYCHOLOGY
* UNIVERSITY OF NOTRE DAME - PSYCHOLOGY
OHIO STATE UNIVERSITY - PSYCHOLOGY
* OHIO UNIVERSITY - PSYCHOLOGY
OKLAHOMA STATE UNIVERSITY, STILLWATER - PSYCHOLOGY
UNIVERSITY OF OKLAHOMA - PSYCHOLOGY
UNIVERSITY OF OREGON, EUGENE - PSYCHOLOGY
* PENNSYLVANIA STATE UNIVERSITY - PSYCHOLOGY
UNIVERSITY OF PENNSYLVANIA - PSYCHOLOGY
* UNIVERSITY OF PITTSBURGH - PSYCHOLOGY
PRINCETON UNIVERSITY - PSYCHOLOGY
PURDUE UNIVERSITY, WEST LAFAYETTE - PSYCHOLOGICAL SCIENCES
UNIVERSITY OF RHODE ISLAND - PSYCHOLOGY
RICE UNIVERSITY - PSYCHOLOGY
* UNIVERSITY OF ROCHESTER - PSYCHOLOGY
* RUTGERS UNIVERSITY, NEW BRUNSWICK - PSYCHOLOGY
RUTGERS UNIVERSITY, NEWARK - PSYCHOLOGY
* SAINT LOUIS UNIVERSITY - PSYCHOLOGY
* UNIVERSITY OF SOUTH CAROLINA, COLUMBIA - PSYCHOLOGY
UNIVERSITY OF SOUTH DAKOTA, VERMILLION - PSYCHOLOGY
UNIVERSITY OF SOUTHERN CALIFORNIA - PSYCHOLOGY
* SOUTHERN ILLINOIS UNIVERSITY, CARBONDALE - PSYCHOLOGY
UNIV OF SOUTHERN MISSISSIPPI, HATTIESBURG - PSYCHOLOGY
STANFORD UNIVERSITY - PSYCHOLOGY
* UNIVERSITY OF FLORIDA, GAINESVILLE - PSYCHOLOGY
FLORIDA STATE UNIVERSITY, TALLAHASSEE - PSYCHOLOGY
UNIVERSITY OF SOUTH FLORIDA, TAMPA - PSYCHOLOGY
SUNY AT ALBANY - PSYCHOLOGY
* SUNY AT BINGHAMTON - PSYCHOLOGY
SUNY AT BUFFALO - PSYCHOLOGY
SUNY AT STONY BROOK - PSYCHOLOGY
SYRACUSE UNIVERSITY - PSYCHOLOGY
* TEMPLE UNIVERSITY - PSYCHOLOGY
* UNIVERSITY OF TENNESSEE, KNOXVILLE - PSYCHOLOGY
TEXAS CHRISTIAN UNIVERSITY, FORT WORTH - PSYCHOLOGY
TEXAS TECH UNIVERSITY, LUBBOCK - PSYCHOLOGY
UNIVERSITY OF TEXAS, AUSTIN - PSYCHOLOGY
* TEXAS WOMAN'S UNIVERSITY, DENTON - PSYCHOLOGY
UNIVERSITY OF TOLEDO - PSYCHOLOGY
TULANE UNIVERSITY - PSYCHOLOGY
* UNIVERSITY OF UTAH, SALT LAKE CITY - PSYCHOLOGY
UTAH STATE UNIVERSITY, LOGAN - PSYCHOLOGY
VANDERBILT UNIVERSITY - PSYCHOLOGY
* UNIVERSITY OF VERMONT - PSYCHOLOGY
VIRGINIA COMMONWEALTH UNIVERSITY - PSYCHOLOGY
VIRGINIA POLYTECHNIC INSTITUTE AND STATE UNIV - PSYCHOLOGY
UNIVERSITY OF VIRGINIA - PSYCHOLOGY
WASHINGTON STATE UNIVERSITY, PULLMAN - PSYCHOLOGY
WASHINGTON UNIVERSITY (ST LOUIS) - PSYCHOLOGY
* UNIVERSITY OF WASHINGTON, SEATTLE - PSYCHOLOGY
WAYNE STATE UNIVERSITY - PSYCHOLOGY
* WEST VIRGINIA UNIVERSITY - PSYCHOLOGY
WESTERN MICHIGAN UNIVERSITY - PSYCHOLOGY
* UNIVERSITY OF WISCONSIN, MADISON - PSYCHOLOGY
UNIVERSITY OF WISCONSIN, MILWAUKEE - PSYCHOLOGY
UNIVERSITY OF WYOMING - PSYCHOLOGY
YALE UNIVERSITY - PSYCHOLOGY
YESHIVA UNIVERSITY - PSYCHOLOGY

INSTRUCTIONS

At the top of the next page please provide the information requested on the highest degree you hold and your current field of specialization. You may be assured that all information you furnish on the survey form is to be used for purposes of statistical description only and that the confidentiality of your responses will be protected.

On the pages that follow you are asked to judge 50 programs (presented in random sequence) that offer the research-doctorate. Each program is to be evaluated in terms of: (1) scholarly quality of program faculty; (2) effectiveness of program in educating research scholars/scientists; and (3) change in program quality in the last five years (see below). Although the assessment is limited to these factors, our committee recognizes that other factors are relevant to the quality of doctoral programs, and that graduate programs serve important purposes in addition to that of educating doctoral candidates.

A list of the faculty members signficantly involved in each program, the name of the academic unit in which the program is offered, and the number of doctorates awarded in that program during the last five years have been printed on the survey form (whenever available). Although this information has been furnished to us by the institution and is believed to be accurate, it has not been verified by our study committee and may have a few omissions, misspellings, or other errors.

Before marking your responses on the survey form, you may find it helpful to look over the full set of programs you are being asked to evaluate. In making your judgments about each program, please keep in mind the following instructions:

(1) Scholarly Quality of Program Faculty. Check the box next to the term that most closely corresponds to your judgment of the quality of faculty in the research-doctorate program described. Consider only the scholarly competence and achievements of the faculty. It is suggested that no more than five programs be designated "distinguished."

(2) Effectiveness of Program in Educating Research Scholars/Scientists. Check the box next to the term that most closely corresponds to your judgment of the doctoral program's effectiveness in educating research scholars/scientists. Consider the accessibility of the faculty, the curricula, the instructional and research facilities, the quality of graduate students, the performance of the graduates, and other factors that contribute to the effectiveness of the research-doctorate program.

(3) Change in Program Quality in Last Five Years. Check the box next to the term that most closely corresponds to your estimate of the change that has taken place in the research-doctorate program in the last five years. Consider both the scholarly quality of the program faculty and the effectiveness of the program in educating research scholars/scientists. Compare the quality of the program today with its quality five years ago--not the change in the program's relative standing among other programs in the field.

In assessing each of these factors, mark the category "Don't know well enough to evaluate" if you are unfamiliar with that aspect of the program. It is quite possible that for some programs you may be knowledgeable about the scholarly quality of the faculty, but not about the effectiveness of the program or change in program quality.

For each of the programs identified, you are also asked to indicate the extent to which you are familiar with the work of members of the program faculty. For example, if you recognize only a very small fraction of the faculty, you should mark the category "Little or no familiarity."

Please be certain that you have provided a set of responses for each of the programs identified on the following pages. The fully completed survey form should be returned in the enclosed envelope to:

Committee on an Assessment of Quality-Related
Characteristics of Research-Doctorate Programs
National Research Council, JH-638
2101 Constitution Avenue, N.W.
Washington, D.C. 20418

Our committee will be most appreciative of your thoughtful assessment of these research-doctorate programs. We welcome any comments you may wish to append to the completed survey form.

PLEASE PROVIDE THE FOLLOWING INFORMATION: FORM NO. 4128-78

HIGHEST DEGREE YOU HOLD: ( ) PH.D. ( ) OTHER (PLEASE SPECIFY): ______________________

YEAR OF HIGHEST DEGREE: __________

INSTITUTION OF HIGHEST DEGREE: ______________________________

YOUR CURRENT FIELD OF SPECIALIZATION (CHECK ONLY ONE):

A. ( ) CLINICAL PSYCHOLOGY
B. ( ) COUNSELING AND GUIDANCE
C. ( ) DEVELOPMENTAL/GERONTOLOGICAL PSYCHOLOGY
D. ( ) EDUCATIONAL PSYCHOLOGY
E. ( ) EXPERIMENTAL PSYCHOLOGY
F. ( ) INDUSTRIAL/PERSONNEL PSYCH.
G. ( ) PHYSIOLOGICAL PSYCHOLOGY
H. ( ) PSYCHOMETRICS
I. ( ) SCHOOL PSYCHOLOGY
J. ( ) SOCIAL PSYCHOLOGY
K. ( ) PSYCHOLOGY, GENERAL
L. ( ) OTHER (PLEASE SPECIFY):

____

INSTITUTION: UNIVERSITY OF NEBRASKA, LINCOLN FORM NO. 4128-01
DEPARTMENT/ACADEMIC UNIT: PSYCHOLOGY
TOTAL DOCTORATES AWARDED 1976-80: 67

PROFESSORS: William J. ARNOLD, James K. COLE, Richard A. DIENSTBIER, Frank J. DUDEK, Herbert HOWE, Donald D. JENSEN, Alvin W. LANDFIELD, Monte M. PAGE, Bruce D. SALES, Harry P. SHELLEY, Theo P. SONDEREGGER

ASSOCIATE PROFESSORS: John J. BERMAN, Virginia A. BERMAN, Daniel J. BERNSTEIN, James L. CONNOR, John H FLOWERS, David Scott HARGROVE, P. Clayton RIVERS, Brian P. V. SARATA

ASSISTANT PROFESSORS: Natalie P. PORTER, William D. SPAULDING

SCHOLARLY QUALITY OF PROGRAM FACULTY

1. ( ) DISTINGUISHED
2. ( ) STRONG
3. ( ) GOOD
4. ( ) ADEQUATE
5. ( ) MARGINAL
6. ( ) NOT SUFFICIENT FOR DOCTORAL EDUCATION

0. ( ) DON'T KNOW WELL ENOUGH TO EVALUATE

FAMILIARITY WITH WORK OF PROGRAM FACULTY

1. ( ) CONSIDERABLE FAMILIARITY
2. ( ) SOME FAMILIARITY
3. ( ) LITTLE OR NO FAMILIARITY

EFFECTIVENESS OF PROGRAM IN EDUCATING RESEARCH SCHOLARS/SCIENTISTS

1. ( ) EXTREMELY EFFECTIVE
2. ( ) REASONABLY EFFECTIVE
3. ( ) MINIMALLY EFFECTIVE
4. ( ) NOT EFFECTIVE

0. ( ) DON'T KNOW WELL ENOUGH TO EVALUATE

CHANGE IN PROGRAM QUALITY IN LAST FIVE YEARS

1. ( ) BETTER THAN FIVE YEARS AGO
2. ( ) LITTLE OR NO CHANGE IN LAST FIVE YEAR
3. ( ) POORER THAN FIVE YEARS AGO

0. ( ) DON'T KNOW WELL ENOUGH TO EVALUATE

INSTITUTION: UNIVERSITY OF UTAH, SALT LAKE CITY FORM NO. 4128-02
DEPARTMENT/ACADEMIC UNIT: PSYCHOLOGY
TOTAL DOCTORATES AWARDED 1976-80: 71

PROFESSORS: James F. ALEXANDER, Irwin ALTMAN, Ernst G. BEIER, Martin M. CHEMERS, Victor B. CLINE, Leslie COOPER, Donna M. GELFAND, Oakley J. GORDON, Donald P. HARTMANN, William A. JOHNSTON, Raymond P. KESNER, Michael E. LAMB, Marigold LINTON, Harold C. NIELSON, Paul B. PORTER, David C. RASKIN, Charles P. SHIMP, Calvin W. TAYLOR, Charles N. UHL, B. Jack WHITE

ASSOCIATE PROFESSORS: David H. DODD, Thomas MALLOY, Richard F. SMITH, Charles W. TURNER, Carol WERNER

ASSISTANT PROFESSORS: S. W. MILLER, Frederick RHODEWALT, Barbara ROGOFF, Donald S. STRASSBERG

SCHOLARLY QUALITY OF PROGRAM FACULTY

1. ( ) DISTINGUISHED
2. ( ) STRONG
3. ( ) GOOD
4. ( ) ADEQUATE
5. ( ) MARGINAL
6. ( ) NOT SUFFICIENT FOR DOCTORAL EDUCATION

0. ( ) DON'T KNOW WELL ENOUGH TO EVALUATE

FAMILIARITY WITH WORK OF PROGRAM FACULTY

1. ( ) CONSIDERABLE FAMILIARITY
2. ( ) SOME FAMILIARITY
3 ( ) LITTLE OR NO FAMILIARITY

EFFECTIVENESS OF PROGRAM IN EDUCATING RESEARCH SCHOLARS/SCIENTISTS

1. ( ) EXTREMELY EFFECTIVE
2. ( ) REASONABLY EFFECTIVE
3. ( ) MINIMALLY EFFECTIVE
4. ( ) NOT EFFECTIVE

0. ( ) DON'T KNOW WELL ENOUGH TO EVALUATE

CHANGE IN PROGRAM QUALITY IN LAST FIVE YEARS

1. ( ) BETTER THAN FIVE YEARS AGO
2. ( ) LITTLE OR NO CHANGE IN LAST FIVE YEAR
3. ( ) POORER THAN FIVE YEARS AGO

0. ( ) DON'T KNOW WELL ENOUGH TO EVALUATE

INSTITUTION: UNIVERSITY OF FLORIDA, GAINESVILLE FORM NO. 4128-03
DEPARTMENT/ACADEMIC UNIT: PSYCHOLOGY
TOTAL DOCTORATES AWARDED 1976-80: 126

PROFESSORS: Yvonne BRACKBILL, William W. DAWSON, Donald A. DEWSBURY, Franz R. EPTING, Jacquelin R. GOLDMAN, Harry A. GRATER Jr, Charles M. LEVY Jr, Norman N. MARKEL, Merle E. MEYER, Henry S. PENNYPACKER Jr, Nathan W. PERRY Jr, Paul G. SCHAUBLE, Barry R. SCHLENKER, Marvin E. SHAW Charles J. VIERCK Jr, Wilse B. WEBB, Robert C. ZILLER

ASSOCIATE PROFESSORS: Afesa M. BELL, William K. BERG, Marc N. BRANCH, Walter R. CUNNINGHAM, Ira S. FISCHLER, Richard A. GRIGGS, James M. JOHNSTON, Edward F. MALAGODI Jr, Patricia H. MILLER, Scott A. MILLER, Dorothy D. NEVILL, Lawrence J. SEVERY, David I. SUCHMAN, Richard M. SWANSON, Carol VANHARTESVELDT

ASSISTANT PROFESSORS: William J. FROMING, Benjamin J. ROBERTS, Richard R. SCOTT, Carolyn M. TUCKER Robert J. WALDBILLIG, Keith D. WHITE

OTHER STAFF: Benjamin BARGER, Rosie P. BINGHAM, Joseph M. KOLARIK

SCHOLARLY QUALITY OF PROGRAM FACULTY

1. ( ) DISTINGUISHED
2. ( ) STRONG
3. ( ) GOOD
4. ( ) ADEQUATE
5. ( ) MARGINAL
6. ( ) NOT SUFFICIENT FOR DOCTORAL EDUCATION

0. ( ) DON'T KNOW WELL ENOUGH TO EVALUATE

FAMILIARITY WITH WORK OF PROGRAM FACULTY

1. ( ) CONSIDERABLE FAMILIARITY
2. ( ) SOME FAMILIARITY
3. ( ) LITTLE OR NO FAMILIARITY

EFFECTIVENESS OF PROGRAM IN EDUCATING RESEARCH SCHOLARS/SCIENTISTS

1. ( ) EXTREMELY EFFECTIVE
2. ( ) REASONABLY EFFECTIVE
3. ( ) MINIMALLY EFFECTIVE
4. ( ) NOT EFFECTIVE

0. ( ) DON'T KNOW WELL ENOUGH TO EVALUATE

CHANGE IN PROGRAM QUALITY IN LAST FIVE YEARS

1. ( ) BETTER THAN FIVE YEARS AGO
2. ( ) LITTLE OR NO CHANGE IN LAST FIVE YEAR
3. ( ) POORER THAN FIVE YEARS AGO

0. ( ) DON'T KNOW WELL ENOUGH TO EVALUATE

APPENDIX D

THE ARL LIBRARY INDEX

(SOURCE: Mandel, Carol A., and Mary P. Johnson, ARL Statistics 1979-80, Association of Research Libraries, Washington, D.C., 1980, pp. 23-24.)

The data tables at the beginning of the ARL Statistics display figures reported by ARL member libraries in 22 categories that, with the exception of the measures of interlibrary loan activity, describe the size of ARL libraries in terms of holdings, expenditures, and personnel. The rank order tables provide an overview of the ranges and medians for 14 of these categories, or variables, among ARL academic libraries as well as quantitatively comparing each library with other ARL member institutions. However, none of the 22 variables provides a summary measure of a library's relative size within ARL or characterizes the ARL libraries as a whole.

The ARL Library Index has been derived as a means of providing this summary characterization, permitting quantitative comparisons of ARL academic libraries, singly and as a group, with other academic libraries. Through the use of statistical techniques known as factor analysis, it can be determined that 15 of the variables reported to ARL are more closely correlated with each other than with other categories. Within this group of 15 variables, some are subsets or combinations of materials. When the subsets and combinations are eliminated, 10 variables emerge as characteristic of ARL libary size. These are: volumes held, volumes added (gross), microform units held, current serials received, expenditures for library materials, expenditures for binding, total salary and wage expenditures, other operating expenditures, number of professional staff, and number of nonprofessional staff.

These 10 categories delineate an underlying dimension, or factor, of library size. By means of principal component analysis, a technique that is a variant of factor analysis, it is possible to calculate the correlations of each of the variables with this hypothetical factor of library size. From this analysis a weight for each variable can be determined based on how closely that variable is correlated with the overall dimension of library size defined by all 10 categories. A high correlation indicates that much of the variation in ARL library size is accounted for by the variable in question, implying a characteristic in which ARL libraries are relatively alike. The component score coefficients, or weights, for

the 1979-80 ARL academic library data are as follows:

Volumes held	.12108
Volumes added (gross)	.11940
Microforms held	.07509
Current serials received	.12253
Expenditures for library materials	.12553
Expenditures for binding	.11266
Expenditures for salaries and wages	.12581
Other operating expenditures	.10592
Number of professional staff	.12347
Number of nonprofessional staff	.11297

From these weights an individual library can compute an index score that will indicate its relative position among ARL libraries with respect to the overall factor of library size. The data for each of the 10 variables are converted to standard normal form and multiplied by the appropriate weight. The resulting scores are expressed in terms of the number of standard deviations above or below the mean index score for ARL academic libraries. Thus, the formula* for calculating a library's 1979-80 index score is as follows:

.12108 (log of volumes held - 6.2916)/.2172
+.11940 (log of volumes added gross - 4.8412)/.2025
+.07509 (log of microforms - 6.0950)/.1763
+.12253 (log of current serials - 4.3432)/.2341
+.12553 (log of expenditures for materials - 6.2333)/.1636
+.11266 (log of expenditures for binding - 5.0480)/.2475
+.12581 (log of total salaries - 6.4675)/.2103
+.10592 (log of operating expenditures - 5.6773)/.2635
+.12347 (log of professional staff - 1.8281)/.1968
+.11297 (log of nonprofessional staff - 2.1512)/.2046

The index scores for the 99 academic libraries that were members of ARL during 1979-80 are shown on the following page. It is important to emphasize that these scores are only a summary description of library size, distributing ARL libraries along a normal curve, based on 10 quantitative measures that are positively correlated with one another in ARL libraries. The scores are in no way a qualitative assessment of the collections, services, or operations of these libraries.

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*For calculation on a hand calculator, the formula can be mathematically simplified to: (.55746 x log of volumes held) + (.58963 x log of volumes added gross) + (.42592 x log of microforms) + (.52341 x log of current serials) + (.76730 x log of expenditures for materials) + (.45519 x log of expenditures for binding) + (.59824 x log of total salaries) + (.40197 x log of operating expenditures) + (.62739 x log of professional staff) + (.55215 x log of nonprofessional staff) - 26.79765.

APPENDIX E

FACULTY RESEARCH SUPPORT

The names of National Science Foundation (NSF) research grant awardees were obtained from a file maintained by the NSF Division of Information Systems. The file provided to the committee covered all research grant awards made in FY1978, FY1979, and FY1980 and included the names of the principal investigator and co-principal investigators for each award. Also available from this file was information concerning the field of science/engineering of the research grant and the institution with which the investigator was affiliated. This information was used in identifying which research grant recipients were on the program faculty lists provided by institutional coordinators.

The names of National Institutes of Health (NIH) and Alcohol, Drug Abuse, and Mental Health Administration (ADAMHA) research grant recipients (principal investigators only) were obtained from the NIH Information for Management Planning, Analysis, and Coordination System. This system contains a detailed record of all applications and awards in the various training and research support programs of these agencies. For the purposes of this study, information analogous to that available from the NSF file was extended for FY1978-80 research grant awardees and their records were matched with the program faculty lists. Measure 13 constitutes the fraction of program faculty members who had received one or more research grant awards from NSF (including both principal investigators and co-principal investigators), NIH, or ADAMHA during the FY1978-80 period.

R&D EXPENDITURES

Total university expenditures for R&D activities are available from the NSF Survey of Scientific and Engineering Expenditures at Universities and Colleges. A copy of the survey form appears on the following pages.

NSF FORM 411 (Dec 1979)

FORM APPROVED
OMB No. 99-R0279

NATIONAL SCIENCE FOUNDATION
Washington, D.C. 20550

SURVEY OF SCIENTIFIC AND ENGINEERING EXPENDITURES AT UNIVERSITIES AND COLLEGES, FY 1979

(Current and Capital Expenditures for Research, Development, and Instruction in the Sciences and Engineering)

Organizations are requested to complete and return this form to:

NATIONAL SCIENCE FOUNDATION
1800 G Street, N.W.
Washington, D.C. 20550
Attn: UNISG

This form should be returned by February 1, 1980. Your cooperation in returning the survey questionnaire promptly is very important.

Financial data are requested for your institution's 1979 fiscal year.

This information is solicited under the authority of the National Science Foundation Act of 1950, as amended. All information you provide will be used for statistical purposes only. Your response is entirely voluntary and your failure to provide some or all of the information will in no way adversely affect your institution.

All financial data requested on this form should be reported in thousands of dollars; for example, an expenditure of $25,342 should be rounded to the nearest thousand dollars and reported as $25.

Where exact data are not available, estimates are acceptable. Your estimates will be better than ours.

Please correct if name or address has changed

(Includes aggregate data from 567 universities and colleges but excludes 19 university-administered FFRDC's)

Include data for branches and all organizational units of your institution, such as medical schools and agricultural experiment stations. Also include hospitals or clinics owned, operated, or controlled by universities, and integrated operationally with the clinical programs of your medical schools. Exclude data for federally funded research and development centers (FFRDC's). A separate questionnaire is included in this package if your institution administers an FFRDC. **If you have any questions please contact Jim Hoehn (202-634-4674).**

Please enter the beginning and ending dates of your institution's fiscal year for which you are reporting on this form:

________________ through ________________

Please note in space below:

(1) Any suggestions to improve the design of the survey questionnaire, (2) any suggestions to improve the instructions, or (3) any comments on significant change in R&D in your institution.

(Attach additional sheets, if necessary.)

PLEASE TYPE OR PRINT NAME OF PERSON SUBMITTING THIS FORM	TITLE	AREA CODE	EXCH	NO.	EXT
NAME OF PERSON WHO PREPARED THIS SUBMISSION (If different from above)	TITLE	AREA CODE	EXCH	NO.	EXT
Please check and correct if necessary the name and address of your institution shown on the mailing label.		DATE			

ITEM 1. CURRENT EXPENDITURES FOR SEPARATELY BUDGETED RESEARCH AND DEVELOPMENT (R&D) IN THE SCIENCES AND ENGINEERING, BY SOURCE OF FUNDS AND BASIC RESEARCH, FY 1979 (Include indirect costs)

ITEMS 1. & 2. INSTRUCTIONS

Separately budgeted research and development (R&D) includes all funds expended for activities specifically organized to produce research outcomes and commissioned by an agency either external to the institution or separately budgeted by an organizational unit within the institution. **Include** equipment purchased under research project awards as part of "current funds." Research funds subcontracted to outside organizations should also be included. **Exclude** training grants, public service grants, demonstration projects, etc.

Under a. **Federal Government.** Report grants and contracts for R&D by all agencies of the Federal Government including indirect costs from these sources.

Under b. **State and local governments.** Include funds for R&D from State, county, municipal, or other local governments and their agencies. Include here State funds which support R&D at agricultural experiment stations.

Under c. **Industry.** Include all grants and contracts for R&D from profitmaking organizations, whether engaged in production, distribution, research, service, or other activities. Do not include grants and contracts from nonprofit foundations financed by industry, which should be reported under **All other sources.**

Under d. **Institutional funds.** Report funds which your institution spent for R&D activities including indirect costs from the following sources: (1) General-purpose State or local government appropriations; (2) general-purpose grants from industry, foundations, or other outside sources; (3) tuition and fees; (4) endowment income. In addition, estimate your institution's contribution to unreimbursed indirect costs incurred in association with R&D projects financed by outside organizations, and mandatory cost sharing on Federal and other grants. To estimate unreimbursed indirect costs, many institutions use a university-wide negotiated indirect cost rate multiplied by the base (e.g., direct salaries and wages, etc.) minus actual indirect cost recoveries. If your institution now separately budgets what was previously classified as departmental research, these data should be included in line d.

Under e. **All other sources.** Include foundations and voluntary health agencies grants for R&D, as well as all other sources not elsewhere classified. Funds from foundations which are affiliated with or grant solely to your institution should be included under d. Institutional funds. Funds for R&D received from a health agency that is a unit of a State or local government should be reported under State and local governments. Also include gifts from individuals that are restricted by the donor to research.

Please exclude from your response any R&D expenditures in the fields of education, law, humanities, music, the arts, physical education, library science, and all other nonscience fields.

Source of funds		(1) Total R&D expenditures	(2) Basic research
		(Dollars in thousands)	(Percent of column 1)
a. Federal Government	1110	$ 3,431,538	73.4 %
*b. State and local governments	1125	467,311	**Basic research** is directed toward an increase of knowledge; it is research where the primary aim of the **investigator** is a fuller knowledge or understanding of the subject under study rather than a practical application thereof.
c. Industry	1150	193,794	
d. Institutional funds	1160	716,241	
(1) Separately budgeted	1161	357,926	
(2) Underrecovery of indirect costs and cost sharing	1162	358,315	
*e. All other sources	1175	373,845	
f. TOTAL (sum of a through e)	1100	$ 5,182,729	68.5 %

CONFIDENTIALITY

Information received from individual institutions in lines 1161 and 1162, or estimates for basic research expenditures, will **not** be published or released; only aggregate totals will appear in publications.

*Combined data cell (See instructions for b and e).

Total R&D expenditures reported in line 1100 column (1) and line 1400 column (1) should be the same.
Federally financed R&D expenditures reported in line 1100 column (1) and line 1400 column (2) should be the same.

ITEM 2. TOTAL AND FEDERALLY FINANCED EXPENDITURES FOR SEPARATELY BUDGETED RESEARCH AND DEVELOPMENT, BY FIELD OF SCIENCE, FY 1979 (Include indirect costs and equipment).

Field of science	Illustrative disciplines		(Dollars in thousands)	
			(1) Total	(2) Federal
a. ENGINEERING (TOTAL)	Aeronautical, agricultural, chemical, civil, electrical, industrial, mechanical, metallurgical, mining, nuclear, petroleum, bio- and biomedical, energy, textile, architecture	1410	$ 715,454	$ 474,866
b. PHYSICAL SCIENCES (TOTAL)		1420	559,566	448,992
(1) Astronomy	Astrophysics, optical and radio, x-ray, gamma-ray, neutrino	1421	39,026	26,862
(2) Chemistry	Inorganic, organo-metallic, organic, physical, analytical, pharmaceutical, polymer science (exclude biochemistry)	1422	204,062	154,031
(3) Physics	Acoustics, atomic and molecular, condensed matter, elementary particles, nuclear structure, optics, plasma	1423	275,680	236,872
(4) Other	Used for multidisciplinary projects within physical sciences and for disciplines not requested separately	1424	40,798	31,227
c. ENVIRONMENTAL SCIENCES (TOTAL)	ATMOSPHERIC SCIENCES: Aeronomy, solar weather modification, meteorology, extra-terrestrial atmospheres GEOLOGICAL SCIENCES: Engineering geophysics, geology, geodesy, geomagnetism, hydrology, geochemistry, paleomagnetism, paleontology, physical geography, cartography, seismology, soil sciences OCEANOGRAPHY: Chemical, geological, physical, marine geophysics, marine biology, biological oceanography	1430	429,129	307,493
d. MATHEMATICAL AND COMPUTER SCIENCES (TOTAL)		1440	145,087	94,534
(1) Mathematics	Algebra, analysis, applied mathematics, foundations and logic, geometry, numerical analysis, statistics, topology	1441	65,637	49,043
(2) Computer sciences	Design, development, and application of computer capabilities to data storage and manipulation, information science	1442	79,450	45,491
e. LIFE SCIENCES (TOTAL)		1450	2,814,824	1,810,729
(1) Biological sciences	Anatomy, biochemistry, biophysics, biogeography, ecology, embryology, entomology, genetics, immunology, microbiology, nutrition, parasitology, pathology, pharmacology, physical anthropology, physiology, botany, zoology	1451	949,993	690,805
(2) Agricultural	Agricultural chemistry, agronomy, animal science, conservation, dairy science, plant science, range science, wildlife	1452	565,697	168,849
(3) Medical	Anesthesiology, cardiology, endocrinology, gastroenterology, hematology, neurology, obstetrics, opthalmology, preventive medicine and community health, psychiatry, radiology, surgery, veterinary medicine, dentistry, pharmacy	1453	1,214,442	890,612
(4) Other	Used for multidisciplinary projects within life sciences	1454	84,692	60,463
f. PSYCHOLOGY (TOTAL)	Animal behavior, clinical, educational, experimental, human development and personality, social	1460	99,732	72,256
g. SOCIAL SCIENCES (TOTAL)		1470	290,057	153,674
(1) Economics	Econometrics, international, industrial, labor, agricultural, public finance and fiscal policy	1471	85,415	40,641
(2) Political science	Regional studies, comparative government, international relations, legal systems, political theory, public administration	1472	39,029	18,452
(3) Sociology	Comparative and historical, complex organizations, culture and social structure, demography, group interactions, social problems and welfare, theory	1473	72,669	46,739
(4) Other	History of science, cultural anthropology, linguistics, socio-economic geography	1474	92,944	47,842
h. OTHER SCIENCES, n.e.c. (TOTAL)*	To be used when the multidisciplinary and interdisciplinary aspects make the classification under one primary field impossible	1480	128,880	68,994
i. TOTAL (SUM of a through h) Check to insure that column totals are identical with data reported in item 1.		1400	5,182,729	3,431,538

*PLEASE EXCLUDE FROM YOUR RESPONSE ANY R&D EXPENDITURES IN THE FIELDS OF EDUCATION, LAW, HUMANITIES, MUSIC, THE ARTS, PHYSICAL EDUCATION, LIBRARY SCIENCE, AND ALL OTHER NONSCIENCE FIELDS.

ITEM 3. CAPITAL EXPENDITURES FOR SCIENTIFIC AND ENGINEERING FACILITIES AND EQUIPMENT FOR RESEARCH, DEVELOPMENT, AND INSTRUCTION, BY FIELD OF SCIENCE AND SOURCE OF FUNDS, FY 1979

ITEM 3. INSTRUCTIONS

Report funds for facilities which were in process or completed during FY 1979. Expenditures for administration buildings, steam plants, residence halls, and other such facilities should be excluded unless utilized principally for research, development, or instruction in engineering or in the sciences. Land costs should be **excluded**. Exclude small equipment items in your current fund account costing approximately $300 or less per unit or as recommended by the Joint Accounting Group (JAG) or as determined by your institutional policy; these are to be reported under items 1 and 2.

Facilities and equipment expenditures **include** the following: (a) Fixed equipment such as built-in equipment and furnishings; (b) movable scientific equipment such as oscilloscopes and pulse-height analyzers; (c) movable furnishings such as desk; (d) architect's fees, site work, extension of utilities, and the building costs of service functions such as integral cafeterias and bookstores of a facility; (e) facilities constructed to house separate components such as medical schools and teaching hospitals; and (f) special separate facilities used to house scientific apparatus such as accelerators, oceanographic vessels, and computers.

Field of science		(Dollars in thousands)		
		Total (1)	Federal (2)	All other sources (3)
a. Engineering	1710	$ 95,399	$ 22,060	$ 73,339
b. Physical sciences	1720	64,551	32,439	32,112
c. Environmental sciences	1730	25,293	8,970	16,323
d. Mathematical and computer sciences	1740	27,465	3,049	24,416
e. Life sciences	1750	456,477	92,567	363,910
f. Psychology	1760	7,803	1,767	6,036
g. Social sciences	1770	20,932	2,069	18,863
h. Other sciences, n.e.c.	1780	31,984	5,054	26,930
i. Total (sum of a through h)	1700	$ 729,904	$ 167,975	$ 561,929

APPENDIX F

Data on Publication Records

Data for measures 17 and 18 were furnished to the committee by the Institute for Scientific Information. The publication records of individual faculty members were derived from the 1978, 1979, and 1980 issues of Social Science Citation Index, compiled and maintained by the Institute. The faculty names (provided by institutional coordinators) were matched with the names of authors and coauthors of all articles published in social science journals during this three-year period. To facilitate the name-matching process, the institutional addresses of authors and the fields of the journals in which their articles appeared were compared with faculty members' university addresses and program fields.

Measure 17 constitutes the total number of 1978-80 articles that have been linked with the names of faculty in a program. Measure 18 is the fraction of program faculty members who had at least one article attributed to them during this three-year period. These measures should not be confused with measures 15 and 16, reported for programs in the mathematical and physical sciences, engineering, and the biological sciences. The latter pair of measures were derived from the Science Citation Index and were not based on matching the names of individual faculty members with the names of authors. A detailed description of the derivation of measures 15 and 16 is contained in Appendix F of the committee's first volume on programs in the mathematical and physical sciences. Data for measures 15 and 16 have been compiled for 148 research-doctorate programs in psychology and are presented in Appendix J of this volume.

Readers interested in a description of the Social Science Citation Index, on which measures 17 and 18 are based, may wish to consult the following references:

E. Garfield, "The 100 Articles Most Cited by Social Scientists, 1969-77," Current Contents: Social and Behavioral Sciences, #32, August 7, 1978.

Norman S. Endler, J. Philippe Rushton, and Henry L. Roediger III, "Productivity and Scholarly Impact of British, Canadian, and U.S. Departments of Psychology," American Psychologist, December 1978, pp. 1064-1082.

APPENDIX G

CONFERENCE ON THE ASSESSMENT OF QUALITY OF GRADUATE EDUCATION PROGRAMS

September 27-29, 1976
Woods Hole, Massachusetts

Participants

Robert A. ALBERTY	Dean of Science, Massachusetts Institute of Technology
Charles ANDERSEN	Coordinator, Education Statistics, American Council on Education
Richard C. ATKINSON	Acting Director, National Science Foundation
R. H. BING	Chairman, Department of Mathematics, University of Texas at Austin
David W. BRENEMAN	Senior Fellow, The Brookings Institution
John E. CANTLON	Vice-President for Research and Graduate Studies, Michigan State University
Henry E. COBB	Professor, Department of History, Southern University
Monroe D. DONSKER	Professor, Courant Institute of Mathematical Sciences, New York University
David E. DREW	Senior Scientist, Rand Corporation
E. Alden DUNHAM	Program Officer, Carnegie Corporation of New York
David A. GOSLIN	Executive Director, Assembly of Behavioral and Social Sciences, National Research Council
Hanna H. GRAY	Provost, Yale University
Norman HACKERMAN	President, Rice University
Philip HANDLER	President, National Academy of Sciences
David D. HENRY	President Emeritus, University of Illinois
Roger W. HEYNS	President, American Council on Education
Lyle V. JONES	Vice Chancellor and Dean, Graduate School, University of North Carolina at Chapel Hill
Charles V. KIDD	Executive Secretary, Association of American Universities
Winfred P. LEHMANN	Professor, Department of Linguistics, University of Texas at Austin
Charles T. LESTER	Vice-President of Arts and Sciences, Emory University

Gardner LINDZEY	Director, Center for Advanced Study in the Behavioral Sciences (Chairman)
Raymond P. MARIELLA	Dean of the Graduate School, Loyola University
Cora B. MARRETT	Center for Advanced Study in the Behavioral Sciences
Peter S. McKINNEY	Acting Dean, Graduate School of Arts and Sciences, Harvard University
Doris H. MERRITT	Dean, Research and Sponsored Programs, Indiana University/Purdue University
John Perry MILLER	Corporation Officer for Institutional Development, The Campaign for Yale
Lincoln E. MOSES	Professor, Department of Family, Community and Preventive Medicine, Stanford University Medical Center
Frederick W. MOTE	Professor, Department of East Asian Studies, Princeton University
Thomas A. NOBLE	Executive Associate, American Council of Learned Societies
J. Boyd PAGE	President, The Council of Graduate Schools in the United States
C. K. N. PATEL	Director, Physical Research Laboratory, Bell Laboratories
Michael J. PELCZAR, Jr.	Vice-President for Graduate Studies and Research, University of Maryland, College Park
Frank PRESS	Chairman, Department of Earth and Planetary Sciences, Massachusetts Institute of Technology
John J. PRUIS	President, Ball State University
Lorene L. ROGERS	President, University of Texas at Austin
John SAWYER	President, The Andrew W. Mellon Foundation
Robert L. SPROULL	President, University of Rochester
Eliot STELLAR	Provost, University of Pennsylvania
Alfred S. SUSSMAN	Dean, Horace H. Rackham School of Graduate Studies, University of Michigan
Donald C. SWAIN	Academic Vice-President, University of California System
Mack E. THOMPSON	Executive Director, American Historical Association
Charles V. WILLIE	Professor of Education and Urban Studies, The Graduate School of Education, Harvard University
H. Edwin YOUNG	Chancellor, University of Wisconsin, Madison
Harriet A. ZUCKERMAN	Associate Professor, Department of Sociology, Columbia University

SUMMARY

September 27-29, 1976, Woods Hole, Massachusetts

Report of the Conference

A substantial majority of the Conference believes that the earlier assessments of graduate education have received wide and important use: by students and their advisors, by the institutions of higher education as aids to planning and the allocation of educational functions, as a check of unwarranted claims of excellence, and in social science research.

The recommendations which follow attempt to distill the main points of consensus within the conference. This report does not in any sense adequately represent the rich diversity of points of view revealed during the Conference nor the deep and real differences in belief among the participants.

Recommendations

1. A new assessment of graduate programs is needed, and we believe that the Conference Board is an appropriate sponsor. While we do not propose to specify the details of this assessment, we are prepared to suggest the following guidelines.

2. The assessment should include a modified replication of the Roose-Andersen study, with the addition of some fields and the subdivision of others.

3. It is important to provide additional indices relevant to program assessment such as some of those cited by Breneman, Drew, and Page. The Conference directs specific attention to the CGS/ETS Study currently nearing completion and urges that the results of that study be carefully examined and used to the fullest possible extent.

4. The initial assessment study should be one of surveying the quality of scholarship and research and the effectiveness of Ph.D. programs in the fields selected for inclusion.

    a. It is intended that the study be carried forward on a continuing basis to provide valuable longitudinal data. This should be implemented along the lines suggested by Moses, involving annual assessment of subsets of programs.

    b. Every eligible institution should be given the choice of whether to be included in the study.

    c. Each program is to be characterized by a set of scores, one for each selected index. The presentation of scores for all

reported indices should be accompanied by a discussion of their substantive meaning. In addition, appropriate measures of uncertainty should accompany all tables of results.

5. We propose a simultaneous study exploring ways of reviewing goals of graduate education other than research and scholarship. This would involve review of other doctoral programs and selected master's programs.

APPENDIX H

PLANNING COMMITTEE FOR THE STUDY OF THE QUALITY OF RESEARCH-DOCTORATE PROGRAMS

September 1978

Robert M. Bock
Dean of the Graduate School
University of Wisconsin
at Madison

Philip E. Converse
Institute for Social Research
University of Michigan

Richard A. Goldsby
Department of Genetics
Stanford University

Hugh Holman
Department of English
University of North Carolina
at Chapel Hill

Lyle V. Jones
Vice Chancellor and Dean,
Graduate School
University of North Carolina
at Chapel Hill

Gardner Lindzey, Co-Chairman
Director
Center for Advanced Study in the
Behavioral Sciences
Stanford, California

Sterling McMurrin
Dean of the Graduate School
University of Utah

Lincoln E. Moses
Administrator
Energy Information
Administration
Washington, D.C.

George Pake
Xerox Corporation
Palo Alto, California

C. K. N. Patel
Director, Physical Research
Bell Laboratories

Cornelius Pings
Dean of the Graduate School
California Institute of
Technology

Gordon Ray
President
The John Simon Guggenheim
Memorial Foundation

Harriet A. Zuckerman,
Co-Chairman
Department of Sociology
Columbia University

APPENDIX I

REGION AND STATE CODES FOR THE UNITED STATES AND POSSESSIONS (and U.S. Government)

REGION 1 - NEW ENGLAND

11	Maine
12	New Hampshire
13	Vermont
14	Massachusetts
15	Rhode Island
16	Connecticut

REGION 2 - MIDDLE ATLANTIC

21	New York
22	New Jersey
23	Pennsylvania

REGION 3 - EAST NORTH CENTRAL

31	Ohio
32	Indiana
33	Illinois
34	Michigan
35	Wisconsin

REGION 4 - WEST NORTH CENTRAL

41	Minnesota
42	Iowa
43	Missouri
44	North Dakota
45	South Dakota
46	Nebraska
47	Kansas

REGION 5 - SOUTH ATLANTIC

51	Delaware
52	Maryland
53	District of Columbia
54	Virginia
55	West Virginia
56	North Carolina
57	South Carolina
58	Georgia
59	Florida

REGION 6 - EAST SOUTH CENTRAL

61	Kentucky
62	Tennessee
63	Alabama
64	Mississippi

REGION 7 - WEST SOUTH CENTRAL

71	Arkansas
72	Louisiana
73	Oklahoma
74	Texas

REGION 8 - MOUNTAIN

81	Montana
82	Idaho
83	Wyoming
84	Colorado
85	New Mexico
86	Arizona
87	Utah
88	Nevada

REGION 9 - PACIFIC

90	Guam
91	Washington
92	Oregon
93	California
94	Alaska
95	Hawaii
96	Virgin Islands
97	Panama Canal Zone
98	Puerto Rico

APPENDIX J

Alternative Measures of Published Articles in Psychology

Data from the 1978 and 1979 issues of Science Citation Index have been compiled on published articles associated with research-doctorate programs in psychology and are presented in Table J-1. (Comparable data are not available in any of the other social and behavioral science disciplines.) Publication counts were associated with programs on the basis of the discipline of the journal in which the article appeared and the institution with which the author was affiliated. Two measures have been derived from the publication records: measure 15, the total number of articles published in the 1978-79 period that have been associated with a research-doctorate program, and measure 16, an estimation of the "influence" of these articles. The latter is a product of the number of articles attributed to a program and the estimated influence of the journals in which these articles appeared. The influence of a journal is determined from the weighted number of times, on the average, an article in that journal is cited--with references from frequently cited journals counting more heavily. A more detailed description of the derivation of these measures may be found in Appendix F of the committee's volume on the mathematical and physical sciences, wherein a discussion of the particular limitations of these measures is given on pages 28-29.

Measures 15 and 16 have also been compiled and reported for research-doctorate programs in 16 disciplines in the mathematical and physical sciences, engineering, and the biological sciences. The availability in psychology of measures 15 and 16 as well as measures 17 and 18 affords an opportunity to compare program results on these two pairs of measures. Also of interest are the correlations, reported on the second page of Table J.1, of measures 15 and 16 with each of the other measures used to evaluate programs in psychology. It is not surprising to find a high correlation (r = .78) between measures 15 and 17 since both are estimates of total publication productivity in a program. In comparing these two measures, however, one should keep in mind that they are based on article counts from different sets of journals (Science Citation Index versus Social Science Citation Index) and that the methodologies employed to derive these counts were quite different.

TABLE J.1 Alternative Measures of Published Articles in Psychology
(Raw and Standardized Values)

Prog No.	Published Articles (15)	Published Articles (16)	Prog No.	Published Articles (15)	Published Articles (16)	Prog No.	Published Articles (15)	Published Articles (16)	Prog No.	Published Articles (15)	Published Articles (16)	Prog No.	Published Articles (15)	Published Articles (16)
001.	0		021.	43		041.	1		061.	24		081.	0	
	38	41		70	65		39	41		56	53		38	41
002.	13		022.	21		042.	11		062.	7		082.	11	
	48	44		54	52		47	66		44	44		47	45
003.	26		023.	9		043.	12		063.	30		083.	10	
	58	55		45	57		47	45		61	56		46	46
004.	13		024.	18		044.	21		064.	30		084.	9	
	48	50		52	54		54	47		61	56		45	53
005.	2		025.	10		045.	44		065.	16		085.	0	
	40	41		46	59		71	60		50	45		38	41
006.	16		026.	7		046.	4		066.	7		086.	12	
	50	45		44	47		41	42		44	43		47	65
007.	2		027.	8		047.	NA		067.	0		087.	8	
	40	41		44	42			NA		38	41		44	44
008.	11		028.	28		048.	4		068.	7		088.	29	
	47	52		59	58		41	42		44	42		60	61
009.	23		029.	10		049.	12		069.	6		089.	10	
	55	51		46	45		47	47		43	44		46	45
010.	6		030.	1		050.	16		070.	7		090.	9	
	43	45		39	41		50	47		44	42		45	42
011.	7		031.	9		051.	42		071.	20		091.	6	
	44	43		45	43		69	89		53	48		43	42
012.	15		032.	21		052.	18		072.	13		092.	6	
	50	54		54	48		52	49		48	51		43	43
013.	5		033.	41		053.	2		073.	33		093.	16	
	42	43		69	83		40	42		63	59		50	47
014.	46		034.	0		054.	9		074.	6		094.	19	
	72	61		38	41		45	44		43	42		52	55
015.	0		035.	19		055.	3		075.	6		095.	8	
	38	41		52	60		41	41		43	42		44	44
016.	0		036.	25		056.	13		076.	23		096.	32	
	38	41		57	50		48	48		55	53		62	61
017.	13		037.	40		057.	49		077.	34		097.	10	
	48	43		68	68		75	83		64	74		46	46
018.	32		038.	7		058.	28		078.	36		098.	3	
	62	60		44	45		59	63		65	64		41	41
019.	31		039.	7		059.	15		079.	2		099.	5	
	61	61		44	42		50	45		40	41		42	45
020.	13		040.	1		060.	27		080.	12		100.	17	
	48	43		39	41		58	59		47	47		51	52

NOTE: On the first line of data for every program, raw values for each measure are reported; on the second line values are reported in standardized form, with mean = 50 and standard deviation = 10. "NA" indicates that the value for a measure is not available. Since the scale used to compute measure 16 is entirely arbitrary, only values in standardized form are reported for this measure.

TABLE J.1 Alternative Measures of Published Articles in Psychology
(Raw and Standardized Values)

Prog No.	Published Articles (15)	Published Articles (16)
101.	23 *55*	*52*
102.	36 *65*	*63*
103.	33 *63*	*57*
104.	21 *54*	*58*
105.	36 *65*	*57*
106.	7 *44*	*46*
107.	3 *41*	*42*
108.	20 *53*	*53*
109.	0 *38*	*41*
110.	94 *99*	*89*
111.	7 *44*	*44*
112.	20 *53*	*50*
113.	33 *63*	*54*
114.	21 *54*	*50*
115.	21 *54*	*58*
116.	3 *41*	*41*
117.	17 *51*	*48*
118.	7 *44*	*42*
119.	14 *49*	*45*
120.	10 *46*	*49*
121.	12 *47*	*49*
122.	7 *44*	*42*
123.	15 *50*	*68*
124.	28 *59*	*50*
125.	18 *52*	*49*
126.	5 *42*	*44*
127.	8 *44*	*44*
128.	12 *47*	*47*
129.	1 *39*	*41*
130.	37 *66*	*64*
131.	1 *39*	*41*
132.	8 *44*	*44*
133.	7 *44*	*44*
134.	20 *53*	*49*
135.	6 *43*	*44*
136.	4 *41*	*41*
137.	22 *55*	*47*
138.	23 *55*	*49*
139.	12 *47*	*46*
140.	15 *50*	*48*
141.	9 *45*	*46*
142.	31 *61*	*63*
143.	13 *48*	*44*
144.	11 *47*	*47*
145.	7 *44*	*43*
146.	52 *77*	*73*
147.	NA	*NA*
148.	7 *44*	*43*
149.	31 *61*	*74*
150.	0 *38*	*41*

Summary Statistics Describing Measures 15 and 16

Measure	Number of Programs Evaluated	Mean	Standard Deviation	DECILES 1	2	3	4	5	6	7	8	9
Publication Records												
15 Raw Value	148	16	14	2	6	7	9	12	15	20	25	33
Std Value	148	50	10	40	43	44	45	47	50	53	57	63
16 Std Value	148	50	10	41	42	43	45	47	49	52	57	63

Correlations of Measures 15 and 16 with Other Program Measures

	Measure 01	02	03	04	05	06	07	08	09	10	11	12	13	14	17	18
Measure 15	.68	.37	.25	.30	.18	.14	.43	.67	.64	.09	.69	.56	.42	.55	.78	.42
Measure 16	.59	.36	.19	.43	.14	.18	.56	.78	.75	.01	.81	.71	.56	.53	.77	.45

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